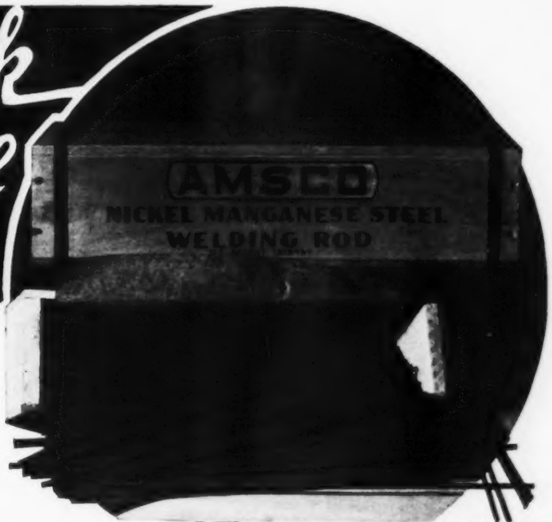
Railway Engineering and Maintenance

for track-work maintenance



AMSCO Nickel Manganese Steel Welding Rod!

The use of AMSCO Nickel Manganese Steel Welding Rod (U. S. Patent 1815464) for building up worn track-work greatly extends the service life and effects worthwhile savings.

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Application is simple as illustrated herewith. Grind and clean the worn part; build up with layers of AMSCO Nickel Manganese Steel Rod; peen the weld to relieve stress and prevent checking; grind the welded part to size; and return the track-work part to service.

AMSCO Nickel Manganese Steel Welding Rod is stocked by all AMSCO foundries and distributors everywhere — in 1/8″, 5/32″, 3/16″, 1/4″ and 5/16″ diameters, coated and bare, 14″ and 18″ lengths; and in coils.

For a better weld on Manganese Steel track-work—and longer, more satisfactory service from the welded part — use AMSCO Nickel Manganese Steel Welding Rod!


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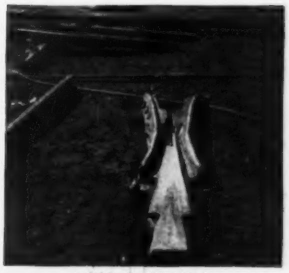
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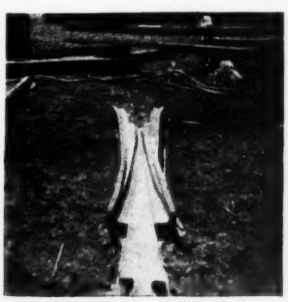
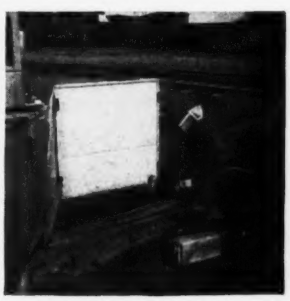

Ground and Ready for Service.


Peening the Weld Metal.


The Final Deposit Weld.


Completing the Welding.

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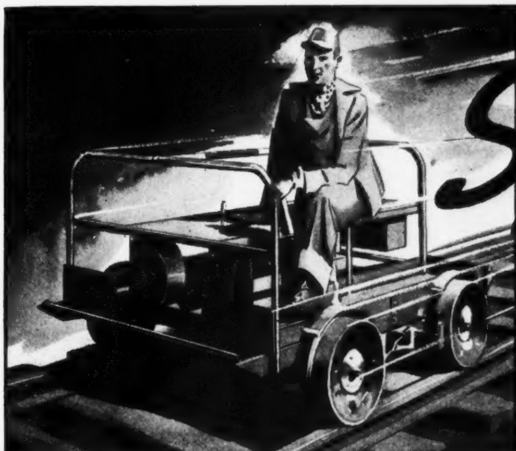

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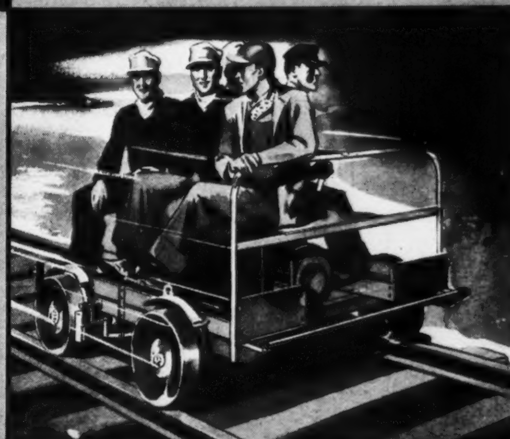

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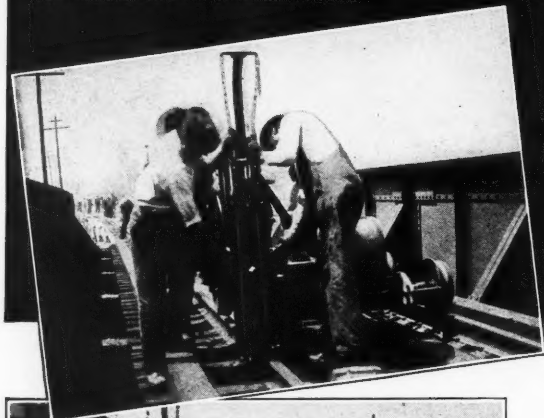

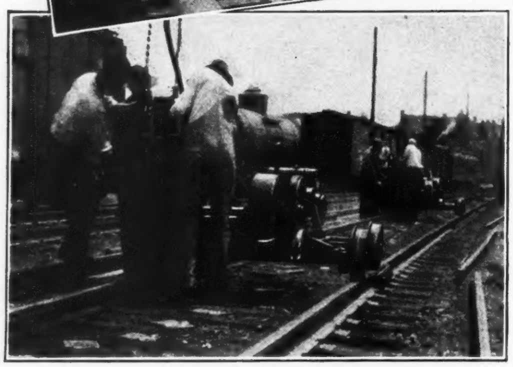

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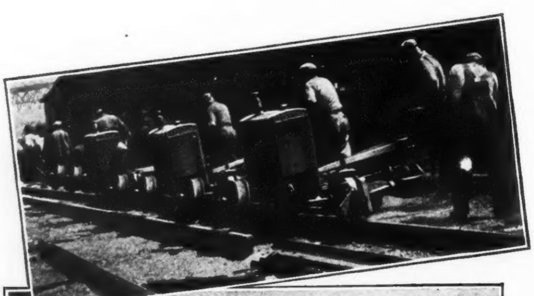

Most roads now require that all new rail be laid on machine adzed ties. Properly prepared tie seats prevent damage to new rail and provide smoother riding track and accurate gauge.

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TONCAN IRON—A PRODUCT OF THE REPUBLIC STEEL CORPORATION

No. 92 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING COMPANY

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: LONG OR SHORT ARTICLES

July 30, 1936

Dear Reader:

Do you prefer that we publish a smaller number of more complete and detailed articles, or a larger number of shorter and necessarily less complete descriptions? This question has been the subject of discussion, and of some difference of opinion, within our own staff. On the one hand it has been contended that you are busy men who want the high points of a method, presented concisely and without details. Others contend that since you are practical men, in direct charge of work, you desire to know the details of the methods being described or, in other words, <u>how</u> the work is being done.

To settle this problem we wrote 500 of you, selected at random, putting this question up to you. We have now analyzed the replies and find that 70 per cent favor the more complete articles as compared with 30 per cent who prefer a greater diversity of shorter articles.

This conclusion is not surprising to me for I have been one of those who have contended that while you are interested in the fact that something was being done, you are much more interested in <u>how</u> it is done—in the details of the methods. It is these details which extend the length of an article and, conversely, reduce the number that we can publish in the space available.

We accept your decision as confirming our practice of endeavoring to tell you, by word and by photograph, <u>how</u> various railways are handling different operations, in the detail that will enable you to determine the adaptability of these methods to your own conditions. By this means we aim to make Railway Engineering and Maintenance of the maximum value to you.

Yours sincerely,

Elmer T. Howson

ETH:JS

Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.


Why

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Railway Engineering and Maintenance

Railroad Week

Challenged Attention of Public

DURING the week of July 13-18, the railways west of Chicago joined in the celebration of "railroad week"—a celebration designed to focus the attention of the public on the railways and on the contribution they are making to the welfare of our people locally and nationally. In hundreds of communities, luncheon meetings of Rotary, Kiwanis and other civic organizations provided opportunity for railway men to tell of the achievements of the roads. In many cities opportunity was afforded for the public to inspect the local shops, round houses and other facilities of the railways; locomotives were placed on exhibition, hand car races, beauty contests among railway office employees, red cap races with baggage, and parades of railway employees (one in Chicago requiring three hours for 15,000 employees to pass the reviewing stand) all served to direct the attention of the public to the nature and magnitude of the service rendered by the railways.

That the effort has been most constructive is evidenced in many ways—by the audiences listening to the railways' story—by the thousands of columns of newspaper space devoted to the railways—by the widespread approbation from so many quarters. At no time within recent years has the public in the area west of Chicago been as railway-conscious as it is now—and this is a first step towards renewed railway patronage.

Credit Due Employees

While this celebration had its inception with the managements of the railways in this area, its success was made possible by the whole-hearted cooperation of the employees. To them is due much of the credit. To them will also accrue much of the benefit as this public good will is converted into patronage.

What they have done so successfully in one week they can well afford to continue, perhaps less aggressively and spectacularly, throughout the year. Likewise in those areas where the railways have not yet officially inaugurated such a movement, employees individually can, within their own spheres of influence, emulate the plans of the western roads and disseminate the story of the railways' accomplishments and of the place which the roads hold in their respective communities.

We have discussed in recent issues the unparalleled safety of railway service—its dependability, especially in periods of storm and adversity—its progressiveness in improving the quality of its service, as illustrated by the many trains of radically new design, the air-conditioning of so many cars, the almost universal speeding up of service, etc. But there is another phase of the railway contribution to public welfare that is just as real, although not so generally realized. It is the contribution which the roads make to the public welfare through their expenditures from day to day.

Taxes

Take the state of Illinois for illustration. Do the people of that state know that the railways within its borders pay more than $25,000,000 every year for the support of government—a burden which the citizens would have to shoulder if the railways were to cease paying taxes? Do the people know that of these taxes, nearly half go to the support of the public schools; that the railroads are paying for the education of one out of every ten children in Illinois today—an army of 100,000 school children, the cost of whose education, but for the railways, would fall on their shoulders? Do these people know that the railways of this one state contribute nearly $3,000,000 a year to the maintenance of the highways of this state? Do they know that they pay $12,000,000 for the support of other government activities?

Pay Rolls

Do the people of Illinois know that the railways of that state provide employment for more than 80,000 of its citizens? Or that they pay these citizens more than $130,000,000 every year in wages? It is only when one stops to consider the number of "railroad towns," or cities in which the railways are among the largest employers, that he realizes the magnitude of the railway contribution to employment. Take Danville (C. & E.I.); Bloomington (Alton); Centralia (I.C.); Decatur (Wabash); Galesburg (C.B. & Q.); Freeport (I.C.); Aurora (C.B. & Q.); Rock Island (C.R.I. & P.) as examples. And what prevails in these cities is to be found to a degree in every village with a railway, for there is an agent and a maintenance gang in almost every community. And these employees, in turn, support merchants and tradesmen, for the earnings of the railway employee go into many avenues of trade.

Purchases

And there is still a third way in which the railways contribute to community development—through the purchases which they make of the myriad of materials and

supplies which they require. Again citing the state of Illinois, the railways spent with concerns within its borders more than $80,000,000 last year for materials. These expenditures went into factories, mills and mines in many communities, providing employment for thousands of men, and extending through another cycle of tradesmen, etc.

These are some of the channels through which the railways contribute to the welfare of the communities throughout this nation—contributions which are all too largely taken for granted and lost sight of by the public. Yet if discontinued, they would create voids and lead to readjustments of a most far reaching character.

A Story to Be Told

It has been said that the railways have suffered because they have not told their story. This is true. But it is equally true that railway employees have suffered severely in reductions in income and loss of position because they also have not told the story of their industry as effectively as the facts warrant. Railroad week has demonstrated that the public is friendly to the railways. Employees have the opportunity therefore to continue the work initiated under such favorable auspices. It constitutes an opportunity—and a responsibility.

A Controversy

Concerning Rails Attached to Bridge Floors

THE article on page 483 reopens the protracted controversy regarding the merits of bridge floors on which the rails are supported and secured directly on the bridge members—usually a concrete slab, compared with the ballast floor. Many bridge engineers do not hesitate to adopt the former construction in "tight places," where the use of anything but the thinnest possible floor would be unduly expensive if not entirely prohibitive. But most railway men in both the track and bridge departments favor the ballast floor and are willing to recommend a reasonable increase in expenditure in order to get it. They contend that it provides better riding track, facilitates ready adjustment of alinement and offers no obstacle to the surfacing of the track immediately beyond the ends of the bridge.

While in the minority, the champions of the direct support of the rails are insistent that the objections to such construction are fancied rather than real, and that enough bridges with this type of floor are now in service under heavy traffic and high speed to disprove the objections made to such construction. They direct attention to the fact that one of the principal objections offered—that of the inability to make ready adjustments in line and surface—applies with equal force to the ordinary open deck and that inasmuch as trackmen have not complained very emphatically about the open deck in this regard the situation cannot be so serious after all. Furthermore, they contend that in view of the satisfactory performance of the structures with rails supported directly on them it is a waste of money to go to any additional expense to obtain a ballast floor.

It is not to be expected that there will ever be any complete agreement in this matter, but it should be possible to arrive at generally acceptable information concerning some of the points at issue. To what extent is it necessary or desirable to adjust the line or surface of the track at or near a bridge? How much cushioning is necessary between the rails and the bridge floor? Are rail fastenings on the direct-support floors reliable? Answers to these and other questions will afford the means of arriving at some measure of agreement on the principal points at issue, and most of the answers will have to be provided by the maintenance officers.

Slack Ties

Should They Be Shimmed or Tamped?

WHEN laying rail slack ties are often encountered, and the question arises as to whether they should be lifted and tamped to a bearing against the rail or shimmed temporarily. In most cases the reason why the ties are low and the number that must be given attention will influence the action to be taken. In general, there are two principal reasons why ties are found to be low after the rail has been laid.

One reason is the fact that ties have not been kept tamped snugly against the rail or they have been cut into by the rail or tie plates. The other arises from the fact that the track had not previously been fully tie plated and that the new tie plates are being applied out of face as the rail is laid. In the latter event, it is obvious that the previously unplated ties will be higher by the thickness of the old tie plates than those that had been plated. In either case, to insure that the new rail will not be surface-bent it will be necessary to provide it with a full bearing on every tie and the question to be decided is how this shall be done.

If many ties are loose it is a practical certainty that the track is not in good surface, and it is almost axiomatic that new rail should not be laid on track that is in poor surface. The action in this case should be, therefore, to give the track a light running surface ahead of the rail gang. This will eliminate slack ties, except perhaps at the joints in the old rail and those affected by the fact that the track may not be fully tie plated.

Where the track has been only partially tie plated, two courses are open. If the track is to be ballasted immediately after the rail is laid, it may be better to omit the tie plates on the previously unplated ties and arrange for them to be put on by the ballasting gang. If it is not done in this way it will be necessary to provide a bearing for the rail by either shimming or tamping the slack ties.

If only a few ties are involved and the ballasting is to be done immediately, shims can be inserted with no detriment to the track, but if the ballasting is to be delayed it is not good practice to carry the rail on shims: it will be far better to tamp the ties. On the other hand, if a considerable number of ties are involved, the ties should be tamped regardless of how soon the ballasting will be done.

Formerly, the work of caring for slack ties was usually delegated to the section gangs, but today the section

forces are so depleted that they are seldom available for tasks outside of their routine work. In this situation, a small unit should be assigned from the rail gang, in charge of a competent assistant foreman who is familiar with this kind of work, to see to it that all ties are giving the proper support to the rail.

Track Bolts

How Can the Proper Tension Be Maintained?

ONE of the perennial questions, widely discussed but never settled, is the proper tension in track bolts. It is no easy matter for the trackman in the performance of routine maintenance to know how much tension he has applied in a bolt when he tightens it in the ordinary way with a track wrench. That this is true is easily demonstrated, for an examination of any stretch of track in which the bolts have been tightened by hand will usually disclose the presence of a wide range of bolt tensions, particularly if several men have been engaged in doing the work.

Furthermore, there is a wide diversity of opinion among maintenance officers as to the tension which should be maintained. Some favor tensions as high as 30,000 to 40,000 lb.; others put the limit at 20,000 lb.; while not a few believe that tensions from 5,000 to 10,000 lb. are sufficient. This is not intended to be a discussion of which of these is right, but of how, after deciding on the tension desired, a uniform tension in all bolts can be maintained.

It is scarcely open to debate that a uniform, or nearly as uniform as practicable, tension is desirable. It is well known that hand wrenching does not produce this uniformity, and that some bolts will be stressed far above the desired average, while others will be well below it. These discrepancies may also be considerably accentuated if the foreman does not supervise the work intensively.

There are now on the market several designs of power bolt tighteners, any one of which, if properly used, will within limits, give the desired bolt tension and do it with a consistency that cannot be expected from hand wrenching. While these machines have been used to some extent for several years in connection with laying rail, they have not been used as extensively even in this work as their merit warrants. With a very few exceptions, prior to this year they have not been used in routine maintenance.

It is in this field that their use will be likely to be of greatest advantage. During the last few years the section gang has been reduced until today on many roads it is little more than a skeleton organization incapable of undertaking any major task. As a result, there is a noticeable trend toward the organization of specialized gangs to do much of the work formerly done by the section forces. One of the roads which has been a pioneer in this method of performing routine maintenance, has also organized a special bolt-tightening gang which is fully equipped with power bolt tighteners and with equipment for oiling rail joints.

This gang, following a regular schedule, goes over all main lines on a given territory, tightening the bolts out of face, thus relieving the section gangs of a time-consuming task, besides doing the work better, more consistently and at lower cost. While the practice on this road may need some modification to adapt it for the requirements of other roads, the method which has been developed is worthy of serious study by maintenance officers, since it is certain that even routine maintenance must be more highly mechanized in the future than it has in the past. One important fact that should not be overlooked in giving the subject consideration, is that the necessary machines for handling the work in this manner are already available.

Fires

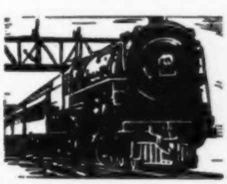
The Drouth Has Created a Serious Hazard

LARGE areas of the United States and Canada are confronted once more with a drouth of grave portent to agriculture. Coming after a winter of heavy snows and a spring of generally normal rainfall, the current dry spell has not seriously affected water supplies as yet, except some of those derived from streams or reservoirs. However, the drouth should be a source of concern to maintenance officers from an entirely different angle—the intensified fire hazard.

Because of the protracted absence of rainfall and the extreme high temperatures, grasses have become dry earlier than usual, while timber and brush lands retain little surplus moisture to resist fires. As a result grass fires are epidemic and forest fires are a daily feature of current news.

From the standpoint of the railways, the answer is increased vigilance. Fire guards not already provided should be plowed at once. Of particular importance is the vegetation in valleys or ravines crossed by wooden structures, for while good practice demands the scalping of the ground under these structures, it is doubly important now, because the grass and brush that are normally green in these locations to the end of the summer have become prematurely parched this year.

But no less important than these protective measures are the precautions that must be taken by everyone to avoid the starting of fires. The fact that many fires on the right of way are started by persons not in railway service does not lessen the responsibility of railway employees to take every precaution which experience and training have taught them. Finally, there is the duty to watch for fires so that steps may be taken to put them out. A minute's work by one man at the start is worth more than the efforts of 100 men ten minutes later.



Skeletonizing the Track

Removing Spikes and Tie Plates from Ties to Be Renewed

Ballasting a Mile of Track

Large system gangs for laying rail, ballasting, renewing ties and other forms of maintenance work have now been used on the Chicago, Milwaukee, St. Paul & Pacific for 10 years. Because of the advantages they have demonstrated in economy and improved quality of work, the use of these gangs as a substitute for more numerous small division gangs has become a settled practice on this road. This article describes the operation of one of the ballasting gangs which this year is scheduled to complete 147 track miles at the rate of a mile a day.

SO THOROUGHLY has the economy of large well equipped system gangs been demonstrated on the Chicago, Milwaukee, St. Paul & Pacific that this road now has 25 of these gangs in service. Of these, 22 are engaged primarily in the renewal of ties, doing only such incidental work as lining and giving the track a light raise as may be necessary in connection with the main operation; 1 is a rail gang which this year is scheduled to lay 190 miles of new and released rail and 2 are ballast gangs, one of which is engaged in ballasting the new rail, while the other is ballasting old rail. In addition, a smaller system gang, equipped with bolting machines and oiling equipment is engaged in tightening bolts and oiling joints, while present plans provide for the organization of a third ballast gang about August 1 to surface relaid rail.

The plan of substituting a limited number of larger gangs for the smaller but more numerous division gangs for laying rail was first tried by the Milwaukee in 1926. The improvements in cost and in quality of work were so marked that in 1927 the development was extended to ballasting, then to tie renewals, later to the welding and

Left to Right—Pulling out the Old Ties—Spacing and Inserting New Ties—The Track Is Carried on 10 Jacks During These Operations

k a Day

heat treating of rail ends and finally to tightening bolts.

The basic ideas back of this development were (1) that the larger gangs can be fully equipped with power machines and be able to use them for a sufficient period during the year to justify their purchase; (2) by concentrating on a single type of work the men in a gang soon become proficient in their appointed tasks and the output per man-hour is greater than that of a gang that shifts from one job to another. Further than this, the plan, as it is carried out, has greatly simplified such problems as the providing of camp equipment, the recruiting of the men for the gangs, the delivery of the various items of material and the assignment of the larger units of work equipment, while there has been a marked reduction in work-train service.

As an example, it is much easier to assign ballast cars and insure regular deliveries of ballast in train-load lots to two or three large gangs that are making steady progress than to make these assignments and smaller or irregular deliveries to 15 or 20, or even more, smaller and widely scattered gangs, some of which may not be making steady progress. Likewise, it is far easier to keep a large tie gang supplied with ties throughout the season than it is to keep 20 or 25 sections supplied, while the unloading can be done much cheaper and the cars will be kept under load for a shorter time.

Schedules Made in Winter

During the early winter, in ample time to permit the purchasing and stores departments to arrange for the necessary material, a specific schedule is prepared for each gang. This schedule shows in detail the number of men to be worked, the territory to be covered on each division, the total number of miles to be completed, the rate at which it is expected to proceed, the date of completion of each section of track, the time required to move to the next job, a list of the equipment to be assigned, a detailed bill of the material that will be needed, the points to which it is to be delivered and the date of delivery at each point.

Copies of this schedule are given to the officers of the division or divisions to which the gang is assigned and to the roadmaster or general foreman in charge of the gang. Requisitions for the necessary material are made by the superintendent of track maintenance, and copies of the schedule are sent to the purchasing agent and the general store keeper to guide them in making deliveries.

It is worthy of note that, in contrast with the confusion of deliveries and conflicting demands for material which were common under the former system when each division organized its own gangs and ordered its material independently, during the 10 years that the present plan has been in operation there has not been a single failure on the part of the purchasing and stores department to have the needed material on hand at the place and time specified.

It is of particular interest and also an illuminating commentary on the relative economy of this method of performing maintenance work, that it has been possible to retain most of the major gangs intact during the depression years when the railways have found it necessary to go to extreme lengths to reduce maintenance expenses. Obviously, however, with an occasional exception, only a skeleton organization has been maintained during the winter.

A Mile a Day

One of the gangs which has remained intact during the 10 years since it was organized, has been engaged in ballasting and surfacing new rail on the more important main lines. This year it is scheduled to complete 147 track miles between April 23 and October 15, at the average rate of 1.05 miles a day, including all delays and the time required to move camp. As an illustration of the closeness with which the actual progress conforms to the estimate, during the 58 working days between April 23, the day on which the gang started, and June 30, an average of 1.15 miles a day were completed. Even this slight difference is accounted for by the fact that during this period more than 60 miles were in one stretch on which no time was lost in moving camp, while there was less than the usual delay because of weather conditions.

During this period the gang was working on the double-track line of the LaCrosse division between Milwaukee, Wis., and LaCrosse, traversed by the Hiawatha, the world's fastest steam train. No unusual features were connected with the project, that is, it was a routine job of renewing ties and ballasting new rail, the track being given an average raise of 4 in. on new ballast, this raise being

The Surfacing Unit—Chuckers in Background

Straightening The Tie Plates on Spaced Ties

Spiking the Line Side

chosen primarily because it is the maximum that can be made in a single lift without settlement which will require later surfacing to keep it smooth. As the roadbed in this territory is of ample width and the drainage is satisfactory, the work was not complicated by the necessity for widening banks or ditching cuts. Furthermore, since the old ballast was clean it was not necessary to discard it, and the digging out of the cribs and the plowing off of the shoulder were avoided.

In accordance with the usual practice on the Milwaukee when laying rail and ballasting on double-track lines, one track was given over to the gang during working hours. Single-track operation was maintained between No. 16 facing-point crossovers, either permanent or temporary as conditions permitted, these crossovers being located at regular telegraph offices where practicable, to avoid the necessity for special operators. At the end of each day's work the track was restored to full operation. On this line all permanent crossovers are No. 16, and where necessary to install temporary crossovers, they were made of the same type to insure the minimum delay to traffic on this busy high-speed line.

During the autumn preceding a ballasting program a tie inspection is made. Preceding the gang, however, and far enough in advance to allow for unloading the ties, a final inspection is made, the ties that are to come out being spotted at this time, while on the far end of each outside rail the number that will be needed in that panel is indicated.

Unloading the Ties

The tie train then distributes the ties, unloading the number indicated for each rail length. The men engaged in unloading the ties, numbering from 16 to 20, are drawn temporarily from various points of the main gang and are returned to their regular work as soon as the unloading is completed.

Also in advance of the main operation, two men, known as fiddlers, with a light frame specially designed to fit across the rails and cover a half panel, mark the spacing for the joint and intermediate ties. They are followed by one man who loosens the bolts on all tight joints to obtain a uniform distribution of the expansion and relieve any expansion stresses that may be in the rail. After this has been accomplished, two men remove the anti-creepers to avoid interference with the tie spacing.

Owing to the fact that the existing ballast was clean and in condition for using under the ties none of it was discarded, and the skeletonizing gang, consisting of 4 jackmen and 8 chuckers, raised the track enough to dispose of the old ballast under the ties. This unit was accompanied by a push car handled by 1 man, carrying an extra supply of tools for its use.

Renewing the Ties

Immediately behind the skeletonizing unit 4 men with claw bars pull the spikes from the ties that are spotted for removal; 1 man picks up and piles the old spikes on the shoulder of the roadbed and 1 man takes off the tie plates; 2 men with jacks give the track a slight lift and 3 men then pull out the old ties and 6 men level down the ballast to permit insertion of the new ties.

Eight jackmen with 10 jacks, also a part of this unit, then raise the track to facilitate the insertion of the new ties and the spacing of the ties. The 10 jacks are set 5 on a side, 2 of the jackmen being constantly engaged in raising with the forward jacks as they are carried ahead by 6 men, 3 to each side, as the spacing and insertions are completed.

While the track is being carried on the jacks 4 sets of spacers, consisting of 2 men each, space all of the ties that are to remain; immediately behind them, 6 men in three pairs, all equipped with tie tongs, pull in the new ties; and 2 men place the tie plates. The last member of this unit is 1 man with a push car carrying a supply of tools for the unit.

In advance of the next unit, 3 men with a push car distribute spikes and tie plugs. In spacing the ties it becomes necessary to straighten some of them, for which reason the tie plates

on these ties do not set square with the rail. One man with a claw bar is therefore assigned to pull the spikes in the crooked plates under the line rail. Following him, 18 line-side spikers, in 6 sets of 3 men, spike the new ties on the line side and those upon which the tie plates need straightening.

All Rail Is Gaged

Next, 4 men with claw bars pull every spike in the gage rail; 1 man takes out the tie plates; 2 men set the tie plugs and 2 men drive them down. Immediately behind this group 1 man sweeps the tie-plate seats and 1 man replaces the tie plates. This group is followed by 3 sets of gage spikers, each set consisting of 4 men, who gage and spike every fourth tie. They are followed in turn by 5 sets of intermediate spikers, of 3 men each, who complete the spiking.

The last operation of this unit is the replacement of the anti-creepers which have been removed ahead of the tie-renewal and spacing unit. This is accomplished by 4 men, 1 of whom peddles the anti-creepers, while the other three re-apply them. To insure that no scrap or usable small track material will be buried when the ballast is unloaded, 2 additional men are assigned to this unit to pile it on the shoulder in the clear of the ballast, while 10 men pile the old ties for burning. Tools that were dropped are picked up by 2 men operating a push car following this unit. In addition, a small gang of 6 to 10 men follows to bring the track to a smooth surface.

This completes the preparation of the track for the reception of the new ballast, which is delivered in train-load lots. Prior to the receipt of the ballast, however, 10 men line the track to stakes. The ballast, which in this case was prepared gravel, is moved on a regular schedule from the pit to the nearest district terminal, arriving at this point early in the day. It is then delivered either at noon or late in the afternoon in accordance with instructions from the general foreman in charge of the gang.

Deliveries average 46 cars, or 2,000 yd. per mile, a day, varying somewhat from this figure, however, depending on the amount of raise and whether the old ballast section was full or slack. Twenty-nine men and a foreman, specially selected from the several units of the gang because of their experience and ability, handle the unloading, and clean crossings and switches. When the ballast train arrives the skeletonized track is filled first, the amount being gaged by the grade stakes, and the remainder is unloaded on the newly surfaced track for use in filling and dressing. In order not to interfere with the work of the gang, in general the unloading is not started until quitting time, when the track has been cleared of all power equipment, push cars, etc.

The schedule for the day contemplates that the surfacing will be completed on all track that was skeletonized on the previous day, and that on the following day the filling and dressing of the track will also be completed. The lining of the newly surfaced track is kept as close behind the surfacing gang as practicable. On the average, therefore, there is an interval of about two miles between the first unit and the dressing gang.

Above—One Man Tends the Spot Board. Right—Lining with the Track Lining Instrument

Equipment for the surfacing gang, which comprises 62 men, consists of 1 Nordberg power jack and an 8-tool Jackson electric tie-tamper outfit. Lifts are made at the joints in the line rail and at 13-ft. intervals. Since the track is covered with ballast, 2 men in advance prepare holes for the jack setting to avoid the possibility of dropping the spud of the power jack onto a tie. One man tends the spot board and keeps it in advance of the jack. and 1 man operates the jack. One levelman accompanies the jack and sets the forward sighting block, while 4 tampers with shovels, 2 to each rail, tamp the ends of the ties to hold the track to surface. Two men with sledges shift ties which interfere with the dropping of the spuds and 4 others follow the raising to replace these ties and straighten others that may have been shifted by the spiking gang.

Immediately behind the power jack and ahead of the tie spacers, 4 men, an assistant foreman, 1 jackman and 2 tampers, known as the "low-spot" gang, pick up and tamp the joints on the gage rail, which rarely come to true surface since the jack settings are 6½ ft. on either side of them, and low quarters on the line rail.

Another Operation

Closely behind the three tie spacers, 8 men fill the cribs and 16 chuckers shovel tamp all ties and clean the cribs to facilitate the work of the tie tampers. This group works four men to a tie, one on the outside and one on the inside at each end, each pair working on opposite sides of the tie. The pairs are spaced, however, so that only one pair works on a tie at any one time, to avoid interfering with those on the opposite end. The ties are tamped from the end to a point 18 in. inside of the rail.

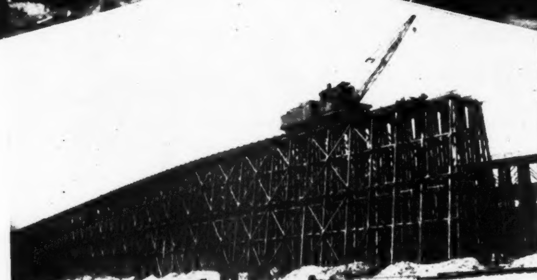
Sixteen men constitute the tamping unit, which is organized in the same way as the chuckers, that is, four men to a tie. One tool is worked outside and one inside the rail at each end of the tie, but each one works on the side opposite that from which the chucking was done. To ease the burden imposed by continuous operation of the tamping tools, the tampers are divided into two groups of 8 men each, which do the tamping on alternate rails. The generator unit follows the tampers, being pushed along the track as the work progresses. Following the generator, 1 man shovel tamps the centers of the ties, and 1 man with a push car brings up the rear to pick up tools that may have been dropped by the men in advance.

Working as closely as practicable behind the surfacing gang, 1 foreman, 1 man with a track-lining instrument, and 10 men with lining bars, line the track. It is the purpose to complete the lining prior to the unloading of the ballast for dressing, although occasionally some lining must be done along with the dressing.

(Continued on page 480)

Power T

Above—Three Steps in the Erection of a Bent



At the Left—A General View of the Approach Trestle

At the Left and Above—Three Uses of Power Tools. At the Right—Swabbing the Ends of Posts With Liquid Tar

Tools Aid Trestle Renewal

Great Northern renews approach to Ore Dock No. 4 at Allouez, Wis., with combination of treated and untreated timber. Work done during severe weather

By **H. S. LOEFFLER**

Bridge Engineer,
Great Northern,
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DURING the four months from December, 1935, to March, 1936, inclusive, the Great Northern employed a force of 70 men in the renewal of 968 ft. of double-track frame trestle that comprised the north half of the approach to its Ore Dock No. 4 on Lake Superior at Allouez, Wis. This work involved the framing and erection of sixty-nine 10-post bents, from 65 ft. to 71 ft. high, in addition to the placing of the deck and bracing, and was carried on with the aid of a locomotive crane and a small power track crane, in addition to power tools. Although the bents were framed on the ice, winter work proved a disadvantage rather than an advantage because of the extreme cold weather, temperatures ranging from zero to 35 deg. F. below zero. However, in spite of this, no accident occurred that resulted in personal injury involving loss of time to any workman.

The approach to Dock No. 4 was built during the winter of 1910-1911 and consisted of a double-track timber trestle about 1,800 ft. long. The south half of this approach was renewed in kind during the winter of 1934-1935, leaving the north half (adjacent to the dock) to be renewed during the winter of 1935-1936.

Construction Features

The timber bents of the new structure are spaced 14 ft. center to center and are framed of 12-in. by 12-in. timbers, each bent containing 10 posts. There are six 10-in. by 18-in. stringers under each track. The bridge ties, 16 in. center to center, are 8-in. by 8-in., 10 ft. long, except where necessary to use greater lengths to support walks, water pipes, etc. The outer guard-rails are 3-in. by 10-in. timbers conforming to the thickness of the planks used in the trainmen's walks. The stringer chords are covered throughout their entire lengths with No. 24 gage galvanized sheet iron, which serve for both fire and weather protection.

In renewing the south half of this approach, it was necessary to drive new foundation piling because the old piles, which were located in ground somewhat above the lake level, were badly decayed. However, in renewing the north half of the approach, it was not necessary to drive new foundation piling because the old piles, which had been driven in shallow water and cut off at lake level, were found to be in good serviceable condition and were used to support the new framed timber trestle.

The Great Northern's Ore Docks

The Great Northern ore docks at Allouez, Wis., consist of four separate structures, each of which is about 75 ft. wide, 80 ft. high (above water surface) and 2,100 ft. long. Docks 1, 2, and 4 are constructed of structural steel and reinforced concrete, while Dock 3 is of timber. The combined storage capacity of the four docks is about 441,800 tons of iron ore, and the maximum amount of ore that has been handled through the combined docks in any one year is 17,355,736 tons.

Each dock carries four railway tracks which converge to double track on the approaches. The approach to Dock 2 consists of a double-track steel trestle 2,917 ft. long, while the approaches to the other three docks are double-track timber trestles. These four approaches, which are constructed to a maximum grade of about one per cent, converge to connect with a double-track railway leading to the ore classification yard about two miles south of the docks.

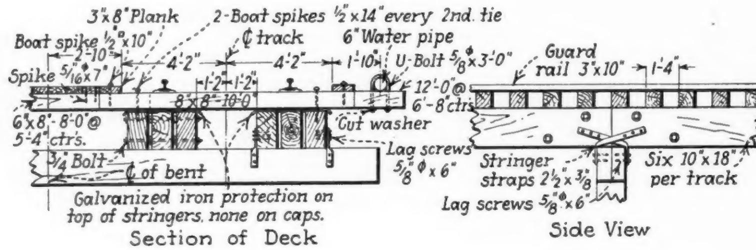
Some Treated Timber

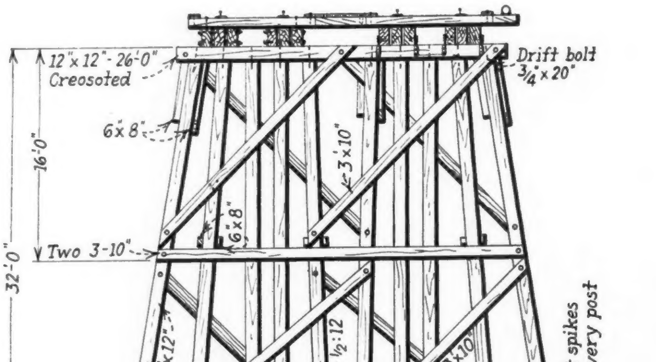
The timber approaches to these ore docks have been constructed and maintained heretofore entirely with untreated timber, because untreated wood has proved more economical for this service in this location than structures constructed of creosoted timber, steel, or concrete. Experience in the maintenance of these untreated timber structures disclosed that certain members, particularly the caps, sills, and intersills, required replacement in from 10 to 12 years after construction, whereas other parts of the structure could be carried several years longer before replacement was necessary. For that reason it was decided to use treated timber for the caps, sills, and intersills of the new structure. The remainder of the timber used in the new structure is untreated Douglas fir.

Experience further disclosed that the timbers decay most rapidly at the joints and at the points of bearing, particularly on pile cut-offs, at the ends of posts, at the ends of stringers, and at the points where the bracing is attached to the posts. This decay is caused by the accumulation and retention of dirt and moisture at these locations. In building the new structure, all of these critical points were thoroughly swabbed with liquid tar (Kopper's Seal Coat) applied hot.

It is thought that the application of liquid tar at these critical points will delay the inception of decay, and that this treatment, together with the use of treated timber for the caps, sills, and intersills, will not only reduce the cost of maintenance materially but will also add a few years serviceable life to the structure. It is also believed that this timber approach as now reconstructed will serve for about 25 years without requiring any major replacements except that the bridge ties will probably have to be replaced in about 15 years because of the decay that always occurs under the rail bearings.

The men employed on this work were divided into three groups. One group of about 20 men did all the framing, a second group of 30 men did the bracing, raised the bents and unloaded the material, while a third group of 20 men placed the deck (stringers, ties, rails, etc.) With the exception of the rails and track fastenings, which were unloaded on the deck, all material was lowered to ground level from cars on the deck of the approach to Dock No. 3, using a Burro crane and a crew of four men. Two teams of horses were employed in skidding the timbers from the point of unloading to the place where the framing crew was at work.





Erection Procedure

The frame bents were assembled on the ice in front of the pile bents on which they were erected, the old trestle having been removed before the erection of the new structure was started. The bents in this north half of the approach trestle are made up in two stories with an intermediate sill, and the two stories were assembled and erected separately, the intersill forming the top of the lower unit. The sway and sash bracing for one side of the bents were bolted into place on the top side of the bent as it lay on the ice, and as a further precaution the sash braces for the under side were secured in place by temporary U-clamps before the bents were raised. Scaffold brackets were also spiked to the posts before the bents were raised.

The bents were erected by a locomotive crane working from the deck of the structure and using a sling of 7/8-in. cable, with about eight feet of 5/8-in. chain at each end for taking hitches around two of the plumb posts. As soon as the bents were set and plumbed, they were tied to the bent previously set by means of two temporary braces, after which the bracing crew placed the 6-in. by 8-in. girts and tower braces, removed the temporary braces and finished the work on the sway and sash bracing. The erection of each top unit of a bent was followed immediately by the setting of the stringers. The tower bracing was placed last, usually about three bents behind the bent erection. This was done by groups of four men with the aid of a 1/2-in. rope tackle.

The deck was completed as fast as the bents were erected, including the laying of both tracks and the installation of a six-inch water main for fire protection, but the placing of the galvanized iron protection for the stringers, the lining of the tracks and the erection of the railings were deferred until after all other work was finished.

All three units of the gang were provided with 3/4-in. electric drills for boring holes, and the bracing crew was equipped also with a 4 3/4-in. electric saw for cutting 3-in. brace planking and dapping the 6-in. by 8-in.

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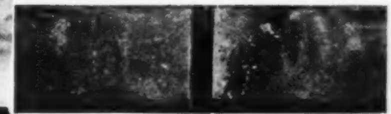
Before



After

Effective Track-Welding Demands Careful Planning

This is an abstract of a report presented at the 1936 convention of the American Railway Engineering Association by a subcommittee of the Committee on Economics of Railway Labor. It outlines principles and considerations that should underlie the formulation of track welding programs and sets up basic track-welding organizations.

WELDING as applied to track maintenance is rapidly assuming a major, definite position in the annual maintenance budget of the railways. At this stage of its development and application, the economic importance of welding cannot be fully evaluated, but some idea of the magnitude of its application can be derived through a consideration of the number of railroads which have adopted the practice during the last 10 years. Although the economy of conserving rails and fastenings was demonstrated previously, economic conditions during the last five years have added impetus to the movement. The need for such a process became more evident as increases in the speed of trains and in axle loads resulted in more rapid deformation of the rail ends under traffic.

Confined to Organization

While several agencies are employed in restoring the ends of used rails in track, it is not within the province of this report to discuss them except insofar as they influence the organization of the forces performing the work. The processes of further hardening the ends of steel rails in track, known generally as heat-treatment, likewise are important to this study only as they require separate organizations or effect the organization of the welding forces when performed as an auxiliary function in combination with welding work.

With welding, as with all functions requiring the expenditure of funds, considerations of economy require, as a prerequisite to the initiation of the work, the formulation of a definite plan and program, which should be prepared, checked and approved well in advance. The preparation of such a program for a given territory should follow an annual rail and welding inspection by the division engineer or his equivalent. If this inspection is done by the local track supervisor the proper general perspective will be lacking and the program will likely reflect distorted conditions, since it is a natural tendency for one to magnify his particular problems under such circumstances.

This inspection will also permit the maintenance officer to determine and evaluate other factors related to welding, principal among which are:

(1) The condition of the track superstructure, with reference to:
  - (a) Surface—low joints, surface-bent rail
  - (b) Underhead wear—rail and joint bars

(2) The general condition of the substructure and roadway, with regard to:
  - (a) Drainage — ballast, subgrade, lateral
  - (b) Topography — crossings, adjacent station platforms, yards, other facilities

It is important that the maintenance officers preparing a welding program have a thorough knowledge of the limitations of welding as a remedy for rough-riding track. When it is doubtful whether to weld battered rail ends, the following may be considered:

(1) Under ordinary conditions on heavy-traffic, high-speed lines, rough-riding track is practically never due entirely to battered rail ends.

(2) Welding alone will do little toward changing the general profile of the track. (a) Surface-bent rail will not be improved by welding. (b) Poorly surfaced track will be affected but little. (c) Dead track, lacking in elasticity, will not be livened.

The welding program should be considered in the light of its rela-

tionship to other major work proposed for that year. It is particularly important that the welding program be co-ordinated with plans for the laying of new rail and surfacing. If the extent of these maintenance functions, especially the former, can be predetermined with reasonable accuracy for a longer period, say from two to five years, further economies through the conservation of energy and materials may be effected.

The organization of forces to perform rail-end welding is subject to and dependent upon many variable factors. These factors, governing progress and and influencing the entire economy of the work, should be kept in mind as each project is being planned, labor allotted, and funds appropriated. They may be classified in the following manner:

(I) Factors contingent on the general maintenance policy

(1) The general practice, whether by choice or necessity, with respect to new rail purchases, and the resultant effect on:
  (a) The life of rail in first location, and the maintenance support given the rail in new-rail territory: i.e., physical components of the track structure, and surfacing, drainage, etc.
  (b) The quality of the rail required, as determined by traffic and study, on the most important branch lines or non-new-rail territory; its standard of maintenance
  (c) The rail on less important branch lines and in yards and terminals

(2) The attitude of the railroad management concerning investment in modern machines for specialized work, particularly welding equipment and independently powered grinding machines

(II) General factors

(1) The condition of the rail as a whole at the time the welding program is formulated
  (a) The amount of battered or chipped rail and the time allowed in which to correct it will largely be the limiting factors in determining whether out-of-face or spot work shall be used and the number and size of the forces organized
  (b) The depth of batter determined upon as the minimum which should be welded, the length of batter, and the extent to which rail joints may be reshaped by up-setting, are important elements

(2) Heat treatment of rail ends at the time of welding

(3) Traffic—kind and amount

(III) Factors of circumstance — local conditions

(1) Condition of rail-ends on the immediate job.

(2) Track: (a) Single or multiple; (b) Topography and alinement—Affect on visibility

(3) Traffic—kind and amount

(4) Distance between camp headquarters and location of welding

Four Organizations

Four gang organizations, using the oxy-acetylene gas method of welding, are presented below. Each is predicated on the use of six welders, as this is the maximum number whose production under steady performance can be surface-ground by one grinding machine when this method of finishing is employed. These may be termed unit-gangs, of which the number required, with any necessary adjustments due to conditions peculiar to the job, is determined by the volume of work. They are employed under ordinary conditions on out-of-face work where the joints are to be cross-slotted, and it is assumed that the track will be put in satisfactory condition prior to the welding work; that is, that the section or other forces shall put all joints in good surface immediately in advance of the welding, apply new or reconditioned joint bars or shims and tighten or renew fittings as required. The estimated daily production of each of the forces given below is based on 6½ hr.* of productive work.

Force A—Welding only; finishing with grinding machine:
6 Welders
1 Grinder operator
1 Grinder operator helper
5 Laborers
1 Foreman
Estimated production, 240 joints per day.

The operations performed by the welders require no detailed description. The grinder operator surface-grinds the joints, and is responsible for the grinding machine, which he keeps in repair; the grinder operator helper operates the cross-grinding machine and assists wherever his services are needed. The laborers' duties include the unloading, loading, storing, transportation to and from the job and handling on the job of the gas cylinders; helping the grinder operator whenever necessary; any necessary flagging; the oiling of joints, where practiced; and the carrying of drinking water.

Force B—Welding and heat-treating; finishing with grinding machine:
6 Welders
1 Grinder operator
1 Grinder operator helper
7 Laborers
1 Foreman
Estimated production, 210 joints per day.

*Six and one-half hours productive time out of an ordinary 8-hr. day, with average heavy traffic, has been found to be a fair approximation.

The operations of this gang differ from Force A only by the addition of the heat-treating process. This treatment is given the rail-ends in the prescribed manner by the welders immediately upon the completion of the weld before the metal has cooled. The two additional laborers are provided to keep the water barrels filled, to carry buckets to fill the quenching dippers, and to assist in the quenching.

Force C—Welding only; finishing with flatters:
6 Welders
6 Welder helpers
2 Laborers
1 Foreman
Estimated production, 180 joints per day.

The welders in this force employ more fully the practice of forging, hammering the deformed rail ends at fusion temperature back to a true surface and adding new metal only where required. The helpers assist in this sledging and in cross-slotting the joints with a hot-cut chisel; they also make manifold and cylinder connections. The duties of the laborers in this organization are the same as in Force A.

Force D—Welding and heat-treating; finishing with flatters:
6 Welders
6 Welder helpers
3 Laborers
1 Foreman
Estimated production, 150 joints per day.

This organization functions in the same manner as Force C, except that heat treating is added to its duties. The additional laborer is assigned to assist wherever his services are required and specifically to help provide quenching water.

On the basis of the foregoing estimates of production, the labor cost of each of the forces is estimated to be as follows:

Estimated Labor Cost

	Daily Cost	Production	Cost Per Joint
Force A	$78.56	240 joints	$0.327
Force B	84.96	210 "	0.405
Force C	71.26	180 "	0.396
Force D	74.46	150 "	0.496

These figures include charges covering the operation, maintenance and depreciation of equipment not common to both methods of finishing the welds, and are based on the following assumed rates of pay:

	Rate per Hour
Welder	$.70
Welder Helper	.50
Grinder Operator	.70
Grinder Operator Helper	.50
Laborer	.40
Foreman	.87

Before work is begun on a track welding project, gas cylinders should be distributed at intervals of 200 ft. over 1,000 ft. of track. A welder,

using 100 ft. of each gas hose, starts at the near end of each of the six 200-ft. sections and works in a forward direction. Thus, when all the welders have completed their respective sections, 1,200 ft. of track will have been completed, or 61 joints where the rail is in 39-ft. lengths and 73 joints where it is 33 ft. long.

It is estimated that each welder will use approximately 90 cu. ft. of each gas per hour, so that about 15 cylinders of each gas will be the daily consumption of the gang. The acetylene complement should preferably consist of two cylinders connected by a manifold. The day's supply of gas should be delivered to the job in the morning, and all empty cylinders taken back at the end of the day. The force will use one heavy-duty motor car, one trailer car, and two or more flat-deck trailers to transport men, equipment and materials.

Welding forces should be provided with outfit cars, comprising living quarters; two material cars, one each for storing oxygen and acetylene; and one equipment car for transporting the motor car, trailers, grinding machines and other equipment, one end of which should have a built-in work bench for making light equipment repairs. If the force is to heat-treat the rail ends it should be furnished with a retired locomotive tender, or a tank mounted on a flat car, for supplying quenching water.

Quality of workmanship is the most important feature of welding; the durability of the weld will determine the economy of the method employed. The cost figures given here are based on the best available data, but are not necessarily indicative of the relative economy of different methods.

Conclusions:

(1) A welding program for a given division or local territory should be based on knowledge secured from a personal inspection of rail by the chief maintenance officer of that territory.

(2) Welding work should be co-ordinated with other maintenance operations, particularly with respect to new rail and surfacing.

(3) Efficient utilization of modern equipment and the introduction of new methods can be brought about most economically by a gang organization designed specifically for such equipment.

(4) The work should be adequately supervised, and periodic checks made to determine (a) If the forces are properly organized; (b) If the welding is being performed according to specifications; (c) When heat-treating, if the desired rail hardness is being secured without injury to the rail.

Treatment of Wood Increased in 1936

THE total quantity of timber given preservative treatment in the United States in 1935 amounted to 179,438,970 cu. ft., which represents an increase of 24,333,247 cu. ft., or almost 16 per cent, as compared with the quantity reported in 1934. Increases were registered in six of the eight classes treated, the largest increase being in ties, amounting to 18,230,680 cu. ft. Poles ranked second with an increase of almost 4 million cubic feet, and switch ties were third with a gain of almost a million cubic feet. Miscellaneous material, wood block and construction timbers followed in the order named. These figures, together with the data to be given later are taken from the twenty-seventh annual statistical report on wood preservation in the United States for 1935, which was compiled by R. K. Helphenstine, Jr., Forest Service, United States Department of Agriculture, in cooperation with the American Wood-Preservers' Association.

Wood Preservation, 1909-1935
Together with consumption of creosote and zinc chloride

Year	Total material treated cu. ft.	Number of crossties treated	Creosote used, gal.	Zinc chloride used, lb.
1909	75,946,419	20,693,012	31,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,888	40,260,416	108,378,359	26,466,803
1914	159,582,639	43,846,987	79,334,606	27,212,259
1915	140,858,963	37,085,585	80,859,442	33,269,604
1916	150,522,982	37,469,368	90,404,749	26,746,577
1917	137,338,586	33,459,470	75,541,737	26,444,689
1918	122,612,890	30,609,209	52,776,386	31,101,111
1919	146,060,994	37,567,247	65,556,247	43,483,134
1920	173,309,505	44,987,532	68,757,508	49,717,929
1921	201,643,228	55,383,515	76,513,279	51,375,360
1922	166,620,347	41,316,474	86,321,389	29,868,639
1923	224,375,468	53,610,175	127,417,305	28,830,817
1924	268,583,235	62,632,710	157,305,358	33,208,675
1925	274,474,538	62,563,911	167,642,790	26,378,658
1926	289,322,079	62,654,538	185,733,180	24,777,020
1927	345,685,804	74,231,840	219,778,430	22,162,718
1928	335,920,379	70,114,405	220,478,409	23,524,340
1929	362,009,047	71,023,103	226,374,227	19,848,813
1930	332,318,577	63,267,107	213,904,421	13,921,894
1931	233,334,302	48,611,164	155,437,247	10,323,443
1932	157,418,589	35,045,483	105,671,264	7,669,126
1933	125,955,828	22,696,565	85,180,709	4,991,792
1934	155,105,723	28,459,587	119,049,604	3,222,721
1935	179,438,970	34,503,147	124,747,743	4,080,887

More Crossties Treated

Crossties given preservative treatment in 1935 totaled 34,503,147, as compared with 28,459,587 in 1934, a gain of 21 per cent. It also compares with the 22,696,565 ties which were treated in 1933, which was the smallest number treated in any one year since 1909, and with 1927, when 74,231,840 ties were given preservative treatment. Of the total number reported, 14,874,561 were hewed and 19,628,586 were sawed; 21,078,821 ties were adzed and bored prior to treatment; 194,382 were adzed but not bored; 2,421,322 were bored but not adzed; and 10,808,622 were neither bored nor adzed.

During the year, 94,037,859 ft. b.m. of switch ties received preservative treatment as compared with 81,341,922 ft. b.m. of this class of material during the previous year, a gain of more than 15 per cent.

There was a slight recession, amounting to 94,828 lin. ft., in the volume of piles treated in 1935, as compared with 1934, the total for last year being 12,678,607 lin. ft. More than 82 per cent of all piles treated during this year were of southern pine, the total quantity of this species being 10,490,989 lin. ft. Second in importance, 1,817,312 lin. ft. of Douglas fir piling received preservative treatment, while the remainder, consisting of oak and miscellaneous species, amounted to only 370,306 lin. ft.

Oak ties ranked first in the number receiving preservative treatment for many years prior to 1934, with southern pine occupying second place. In 1934 this position was reversed and southern pine rose to first place, with oak second and Douglas fir third. In 1935, oak again assumed first place with 15,264,732 ties, or 44 per cent, of this species treated, while southern

Crossties (Number) Treated by Kinds of Wood and Kinds of Preservatives—1935

Kind of wood	Treated with creosote[1]	Treated with creosote-petroleum[2]	Treated with zinc chloride	Treated with miscellaneous preservatives	Total	Per cent of total
Oak	12,243,171	2,789,695	224,805	7,061	15,264,732	44.24
Southern Pine	5,081,729	1,477,788	18,791	5,631	6,583,939	19.08
Douglas Fir	28,285	3,731,618	339,060*	22,378	4,121,341	11.95
Ponderosa Pine		1,601,354	19,769		1,621,123	4.70
Gum	1,223,375	240,974		75,000	1,539,349	4.46
Maple	433,129	622,475	323,651		1,379,255	4.00
Beech	601,064	534,088	86,000		1,221,152	3.54
Birch	253,260	553,313	105,705		912,278	2.64
Tamarack	5,000	325,328	231,569		561,897	1.63
Lodgepole Pine		1,175	493,090		494,265	1.43
Elm	103,000	231,307	200		334,507	0.97
Hemlock	5,000		234,042		239,042	0.69
All other	77,668	144,307	8,292		230,267	0.67
Total	20,054,681[3]	12,253,422	2,084,974	110,070	34,503,147	100.00
Per cent of total	58.13	35.51	6.04	0.32	100.00	

[1]Includes distillate coal-tar creosote, creosote coal-tar solution, refined water-gas tar and water-gas tar solution.

[2]Includes distillate coal-tar creosote, creosote coal-tar solution, refined water-gas tar and water-gas tar solution in mixture with peroleum.

[3]Includes 23,066 crossties treated with mixture of creosote and salt brine.

pine fell to second place, 6,583,939 ties of this wood, or 19 per cent, having been treated. Douglas fir remained in third place, 4,121,341 ties of this species, or 12 per cent of the total, having been treated. Ponderosa pine rose to from next to last to fourth place, with 1,621,123 ties treated, or 4 7 per cent, while gum fell from fourth to fifth place, but almost equaled ponderosa pine, 1,539,349 ties, or 4.5 per cent of the total, of this wood having received preservative treatment.

Of the 34,503,147 ties treated during the year, 20,054,681, or 58.13 per cent were treated with creosote alone or as a coal-tar solution; 12,253,422, or 35.1 per cent were treated with creosote-petroleum mixtures; while only 2,084,974, or 6.04 per cent, were treated with zinc chloride; and 110,070 ties, or 0.32 per cent of the total were treated with miscellaneous mixtures.

From the standpoint of quantity treated, oak switch ties ranked first with a total of 55,547,937 ft. b.m., or more than 59 per cent of the total. Douglas fir came second with 16,891,784 ft. b.m., or 18 per cent. Southern pine followed with 11,539,098 ft. b.m., or 12 per cent; and gum occupied fourth place with 5,832,563 ft. b.m., or more than 6 per cent of the total.

Preservatives

During the year, 124,747,743 gal. of creosote was consumed, an increase of 5,698,139 gal. as compared with 1934. This is the largest consumption since 1931 and is larger than for any year prior to 1923, although it is well below the 226,374,227 gal. consumed in 1929, the peak year. It is of interest that the 1935 consumption has been exceeded in only 9 years since this record was started 27 years ago. Of the creosote consumed in 1935, only 18,010,777 gal, was imported, 106,736,966 gal. having been of domestic production. There was an increase of 858,166 lb. in the consumption of zinc chloride, bringing the total for 1935 to 4,080,887 lb., this being the second smallest consumption of this preservative since 1909. The consumption of miscellaneous preservatives were: salts, 966,825 lb.; liquids, 2,741 gal. This latter compares with 4,706,968 gal. consumed in the record year of 1923.

The quantity of petroleum consumed by the wood-preserving industry in 1935 was 19,205,319 gal., as compared with 14,981,299 gal. in 1934, a gain of 4,224,020 gal. This also compares with the 29,656,181 gal. consumed in 1929, the peak year.

There were 214 wood-preserving plants in the United States at the close of 1935. Of these, 195 were in active operation and 19 were idle. During the year, 4 new plants were constructed, three of which were pressure-cylinder plants and 1 a non-pressure (open-tank) plant. Two non-pressure plants were abandoned during the year. Of the 214 plants existing at the close of the year, 162 were commercial plants that treat wood for sale or by contract, 25 were owned and operated by railroads and 27 were the property of public-utility corporations, mining companies or the federal government.

Ballasting a Mile of Track a Day

(Continued from page 473)

After the track is lined and the ballast unloaded, a unit consisting of 1 foreman, 1 assistant foreman and 25 men, although the assignment is occasionally increased to 40 men, does the dressing. When the ballast is unloaded for dressing, the center is plowed out as fully as practicable, but no shaping is attempted. The gang then dresses the center with shovels, throwing the excess ballast on the shoulder. The section outside of the rail is then dressed to the top of the ties and the final shaping of the shoulder is accomplished with the ballast-shaping attachment of a ditcher-spreader. As the final operation of the gang, a unit, consisting of an assistant foreman and 8 men, follows some distance behind the dressing to pick up and tamp such weak places as always develop when the track is given a general raise, whether the gang performing the work is large or small.

As a part of the new-rail program, there is also an independent unit which follows the ballasting gang, which is equipped with Ingersoll-Rand spike drivers, and is engaged in driving the anchor spikes in the independently fastened tie plates which are being used under the new rail.

In the first four years after the practice of using large system gangs in place of the smaller division gangs was adopted, the labor cost of ballasting, including tie renewals, was reduced by 19 per cent for single track. With the smaller gangs, it was not the custom to divert traffic on double track around the gangs. With the inauguration of the present system, however, traffic was diverted from the track occupied by the gang and as a result, the labor cost for double track was reduced by 49 per cent.

Since that time, costs have continued to decline slowly but steadily as the methods have been perfected, until this year they have reached a new low level. On the 60 miles done early this season, as already mentioned, the labor cost of unloading, spacing and inserting an average of 620 new ties to the mile, has averaged $217.33 a mile, the cost of renewal alone having been $0.1363 per tie, or $84.50 a mile.

The cost of unloading the ballast, raising lining and dressing the track has aggregated $387.68 a mile; the cost of removing and reapplying tie plates has been $96.61; and of removing and reapplying anti-creepers, $9.23. These figures together with $82.49 for skeletonizing the track and the cost of work-train service, including transportation of the ballast from the pit, brings the total cost of the ballasting work for labor and work-train service to $831.86 a mile.

A Section of One of the Shimmed Tracks Shortly Before the Shims Were Renewed—Note the Close Clearance Between the Base of the Low Rail and the Floor Beam Shown in the Foreground

Treated Gum Shims Salvage Plate-Cut Bridge Ties

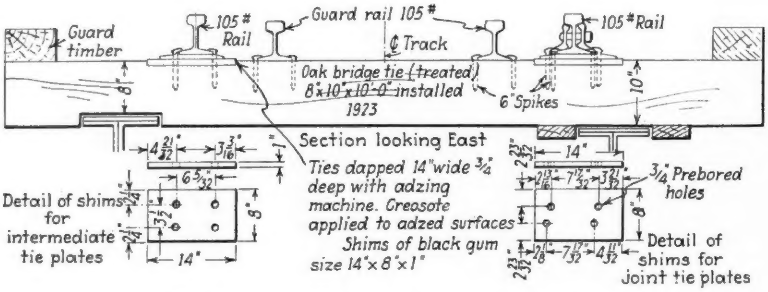
Practical experiment on the New York Central extends life of expensive timbers six years at small cost and indicates further possibilities of this method

THROUGH the use of treated black gum shims beneath the tie plates, the Mohawk division of the New York Central, at small cost, is extending the life of a number of badly plate-cut, but otherwise sound treated red oak bridge ties. The life of 350 such ties has already been extended three years by one set of shims, and a second set of shims, which replaced the first set recently, holds forth the possibility of extending their life at least another three years. The situation which suggested the use of the shims existed on the double-track west approach viaduct to the road's bridge over the Hudson river in Albany, N. Y., where traffic is heavy but where speeds are relatively slow in view of the close proximity of the Albany passenger station. On the viaduct, which consists principally of a series of through girder spans, the ties, 8 in. by 10 in. by 10 ft. long, rest directly on the steel I-beam stringers in open-deck construction. The section of the viaduct where the cutting of the ties was most severe, is on a 7-deg. 30-min. curve. Here, a maximum of 1½ in. of superelevation had been provided in the outer rails of both tracks by dapping the under sides of the ties only beneath the low rails, and by resting the full depth of ties on the stringers beneath the high rails, secured laterally by blocks on each side of the stringer flanges. The difficulty with the plate-cut ties arose through the fact that the deck floor beams projected up between the ties about eight inches above the tops of the stringers, or practically level with the tops of the ties on the low side, and that with the embedding of the tie plates in the ties, the base of the low rail finally came in contact with the cover plate rivet heads, throwing direct impact on the beams and affecting the signal circuits.

This condition became quite general late in 1931, when consideration was given to renewing the ties around the curve to restore the original clearance over the floor beams. The ties were of red oak and had been installed in 1923. Aside from the crushing beneath the rail, which had occurred beneath low and high rails in spite of the use of 7-in. by 10-in. tie plates, the ties were in an entirely satisfactory condition. It was estimated that to renew the ties in kind would be costly, even considerably above the normal cost for such work, both because of the frequency of train anl light engine movements over the bridge, and also because of lack of space to handle materials.

Having given some consideration to the use of wooden shims beneath the plates as a general means of preventing the mechanical wear of ties, the idea of renewing the cut bridge ties was abandoned and it was decided to build up the ties and restore the level of the rails by placing creosoted black gum shims beneath the tie plates. The shims employed were 14 in. long by 8 in. wide by 1 in. thick, and were cut, bored for spikes and treated at the road's treating plant at Rome, N. Y.

Working during the early morning, when traffic was lightest, one rail of each track was repaired at a time. After a section of the running rail, with the adjacent inside guard rail, had been removed and all spike holes had been plugged with treated tie plugs, power adzing machines were used to cut snug level-base housings, ¾ in. deep, for the shim. After the cuts had been made, the newly exposed wood was swabbed with hot creosote, and the shims were then tapped into place to a snug fit. The tie plates and the running rails were then set back into place and spiked, 6-in. cut spikes being used, the same length as had been removed. When the guard rail had been replaced, the work was completed.



Shims and Methods of Shimming Used to Restore Level of Plate-Cut Bridge Ties

The only concern about the shimmed ties was the possibility of spread gage and of decay of the ties directly beneath the shims. To guard against the former, the shims were cut to a tight fit and both rails of each track were double spiked on the inside. The hot concrete was applied to prevent the decay of the ties beneath the shims.

Careful observation of the shimmed track for three years showed no widening of gage, in spite of the frequent heavy train movements over the tracks. Gradually, however, the tie plates cut into the shims as they had originally into the ties, and during the third year a number of the shims split. Neither of these conditions became at all serious, but at the end of three year's service, in February of this year, the shims were renewed in kind, out of face, the major concern being that water, working its way through cracks in the shims might be causing or would permit decay of that area of the ties directly beneath the shims.

The renewal of the shims was accomplished in much the same manner as in the original installation, except that the work was much more simple and less costly in that no adzing of the ties was necessary and the guard rails did not have to be disturbed. Without exception, there had been no decay or softening of the ties beneath the shims, so that the only work preparatory to setting in the new shims was that of sweeping off the old seats and recoating them with creosote.

On the original work, because of the number of operations required, and the desirability of getting the work out of the way at the earliest date, an extra gang of considerable size was employed. However, in the renewal of the shims, with no necessity for removing the guard rails or for adzing, a gang of only three to four men was used.

The cost of installing the original shims in 1932, including the cost of the shims themselves and all labor operations, was about 11 per cent of the estimated cost of renewing the ties, including the cost of ties, while the cost of renewing the shims this year, was only approximately 3.7 per cent of the estimated cost of the renewal of the ties. On the basis of the experience with the original shims and in view of the condition of the ties at the present time, there is no question but that the life of the ties will be extended another three years, and possibly longer, even to the extent of making advisable the application of a third set of shims if that becomes necessary. Even if the life is extended only another three years, the annual cost per salvaged tie during the six years of its extended life will be relatively small as compared with the annual cost per tie for new ties, if it is assumed that new ties, like the original ties, would have a service life, unshimmed, of only 10 years.

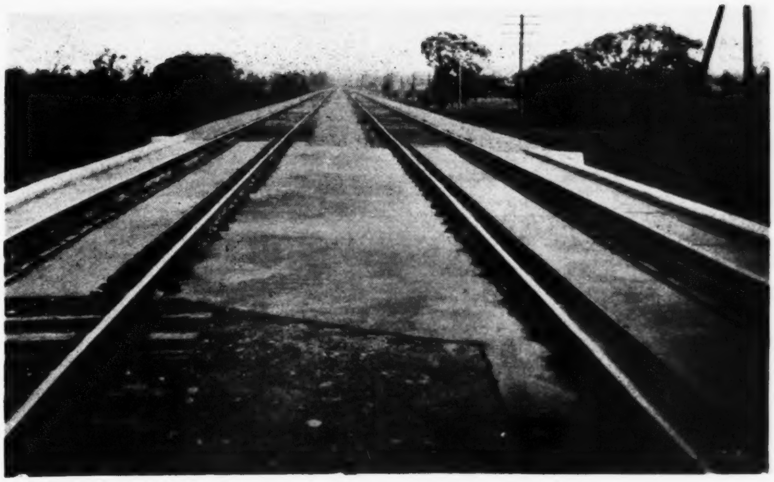
The original installation of shims on the bridge approach was carried out under the supervision of J. E. Egan, supervisor of track, and T. P. Soule, at the time supervisor of bridges and buildings, but now general supervisor of bridges and buildings, while the renewal of the shims was carried out under the supervision of G. W. Clark, supervisor of track, and E. E. Tanner, supervisor of bridges and buildings.

Passenger Train Derailed on D. & S. L.

ON NOVEMBER 8, 1935, a westbound Denver & Rio Grande passenger train was derailed at Sulphur, Colo., while running on the Denver & Salt Lake, over which the former road operates between Denver and Orestod, one passenger being injured, the cause of the accident being ascribed by the Bureau of Safety to poor maintenance. Approaching the point of accident from the east, the track is tangent for 1,460 ft. followed by a compound curve which ranges from 0 deg. 42 min. at its east end to 3 deg. 30 min. at the west end. The accident occurred on the 3-deg. section of this curve.

The train was composed of nine cars and was traveling at about 40 miles an hour at the time of the accident. The locomotive and the first six cars were derailed.

According to evidence reported by the Bureau of Safety of the Interstate Commerce Commission, the 100-lb. rail had been laid in May, 1935, to replace 80-lb. rail, but no work in the way of tie renewals, ballasting or surfacing had been done since the new rail was laid. In its discussion of the accident the Bureau stated that examination of the track showed it to be in poor condition; that the gage was ¾ in. wide at the point of derailment; that the superelevation on the curve varied from 2¼ in. to 3⅛ in., being 2¼ in. at the point of accident, where the curvature is 3 deg.; that approximately 15 per cent of the ties were split; and that the track was generally center-bound. There was insufficient ballast, with no shoulder on the south side (the inside of the curve), and at four points the track was churning severely. From the evidence the Bureau concluded that the derailment was caused by spreading rails, resulting from inadequate maintenance.



Embedded Longitudinal Stringers
This deck has been under light branch line service since 1915 and is in splendid condition. Here 6-in. by 14-in. stringers are set in a slot 3 in. deep, with asphalt sealing the sides.

Fastening the Rail to the Bridge Floor*

By F. W. CAPP
Portland Cement Association, Chicago

BALLAST-DECK bridges, in which the track is supported on ties and ballast across the spans in the same way as on ordinary roadbed, appeal to many engineers today as an ideal form of construction. This form of construction possesses certain advantages, among which are:

1. Continuity of the track structure.
2. Ability to maintain the track with the ordinary track forces.
3. Ability to raise the track to accommodate normal ballast raises without disturbing the span, as is necessary for open-deck spans, and to correct for slight settlement of the substructure.

This form of construction also has certain disadvantages, among which are:

1. An increase in the distance from the top of rail to the under clearance.
2. An increase in the dead load.
3. This type of construction usually requires waterproofing, together with a protective covering, especially on steel spans.
4. Unless proper details prevent the shifting of the slabs, objectionable ballast leaks may develop.
5. Where the floor is composed of small units, the differential deflections or "fluttering" sometimes loosen the ballast and thus increase track maintenance.
6. The ballast usually fouls in time and is difficult to clean; the drains require considerable attention; and the ballast tends to hold objectionable moisture on the deck and at joints.
7. Increasing the depth of the ballast when carrying track raises across ballast-deck through spans sometimes encroaches dangerously on overhead clearances.

Tieless Decks

A review of present structural design and practice has been stimulated by the vast program of grade crossing elimination under way, particularly since the plans must be approved by government engineers. One major point of many of the designs is that of reducing the deck thickness to accommodate restricted clearances. Expensive details leading to troublesome and expensive maintenance, which have been associated with trough floors and other floors of the shallow type on steel spans, have tended to create a prejudice in the minds of railway engineers against shallow floors of any design, which has led them to avoid such construction where possible. For these reasons, the advantages inherent in supporting tracks directly on concrete bridge decks have not received the attention from railway engineers that they merit. Rails supported in this manner have been subject to severe service for many years.

At times, this design has solved troublesome problems connected with restricted headroom. More recently, this type has been used in cases where choice was not limited. Such structures and comparable installations of concrete-supported track are functioning satisfactorily; they possess excellent riding qualities and require the minimum of maintenance.

It is obvious that some medium must be introduced between the rail and the concrete surface to prevent objectionable jarring and harshness, which result from the metal-to-metal contact between the rails and the concrete being transferred to the cars. The thickness required for such a

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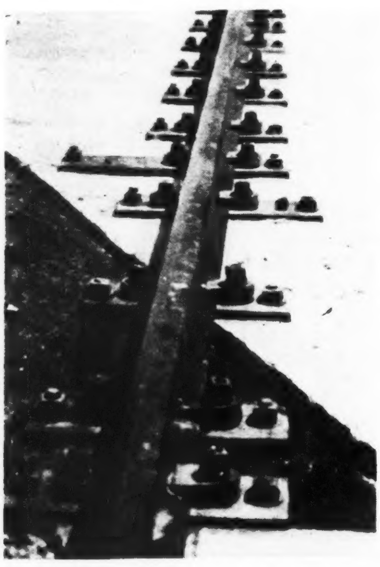
*This discussion was submitted for publication in the What's the Answer department in the December issue, but because of its scope it was withheld for presentation here as an independent article. For further discussion of this subject, see page 749 of the December issue.

medium is unbelievably small. For instance, on the Pere Marquette experimental track, a longitudinal plank 1 in. thick was found to be sufficient to eliminate all harsh-riding characteristics, while the Canadian National has had the same experience with its ballastless, tieless bridge decks.

This latter road has just completed a rigid-frame bridge, which forms the roof over the waiting room of the station at one of its sizable terminals. The rails on this deck are supported on steel plates at the usual crosstie spacing, which are cushioned on lead plates 1/8 in. thick resting directly on the concrete deck. This deck is reported to be exceptionally quiet and freer from traffic jars and vibration than similar bridges having ties and ballast as the track support.

Concrete bridge floors having the track supported directly on the concrete possess certain advantages among which are:

1. The thickness of the deck is reduced at once by the sum of the thickness of the tie and the depth of the ballast, the thickness of the waterproofing and its protection, less the thickness of the shock-absorbing medium. This total usually approximates 16 in. This is an outstanding advantage in most grade-separation structures. By setting the rail in a trough, it is possible to reduce the thickness by an additional six inches without introducing troublesome details.



Steel Plates at Crosstie Spacing

Short steel plates with a 1/8 in. thickness of sheet lead beneath, spaced the same as crossties, are fastened directly to the concrete. The holding-down clips are fastened to the plates with bolts having countersunk heads.

2. The dead load is reduced by the weight of the ties, ballast, waterproofing and ballast curbs.

A Thin Longitudinal Plank Under Each Rail

Decks of this type are giving good service. The fastenings are rugged and simple. Drainage provisions are the only waterproofing. A 1-in. longitudinal plank under each rail is all the shock-absorbing medium required.

3. Only the simplest provisions for drainage are needed, the waterproofing blanket and its protection being omitted.

4. Track maintenance is reduced because of the improved drainage; because there is no ballast to shift under the wheel loads; and because the joints receive direct support.

5. This type of concrete deck affords an opportunity to fasten the rails directly to the slab to resist creeping. On curves there is less tendency for the track to get out of line.

There are also certain disadvantages inherent in this design, all of which, however, seem to be of minor importance, while some of them are common to other types of construction. These are:

1. The continuity of the track structure is interrupted, but this is true of all open-deck bridges.

2. The track must be maintained by forces other than the ordinary trackmen. This is true, however, of all open-deck structures.

3. A common objection raised by railway men is that a bridge deck of the type under consideration will create a hard spot in the roadbed. This is a false impression which seems to have had its origin in connection with structures where there are sudden changes in the character of the track support. This is particularly noticeable when the approaches to open-deck bridges are not maintained properly and low spots are allowed to develop back of abutments and parapets.

This same condition can exist in equal degree at any open-deck bridge and may be particularly severe where the change is first from a low spot in the track to ties on the abutment parapet and then to ties supported directly on stringers or the flanges of deck girders. Practical experience over a period of years with rails supported directly on the concrete, demonstrates amply that such track possesses superior riding qualities, owing to its stiffness and the uniformity of its support.

4. This type of construction fixes the elevation of the track and precludes future changes in grade or ballast raises. On the other hand, this is also true of many present structures of other types, such as open-deck bridges of long span, drawbridges, track elevations which contain a series of bridges over streets at relatively short intervals, tunnels and other similar cases. Where proper details for the immediate rail support and fastenings have been adopted, however, the rail can readily be accommodated to moderate grade raises.

Trestle Renewal

(Continued from page 476)

girts, this work being done well in advance of the erection of the pieces. The boring of the holes in the outside tower bracing and girts and the bolting up of these connections was done by one man from a swinging scaffold suspended over the sides of the trestle from the boom of the Burro crane, which moved it from bent to bent.

This reconstruction work was done under the direction of J. R. W. Davis, chief engineer. The plans were prepared by the bridge department. The renewal of the south half of the approach during the winter of 1934-35 was done under contract by the Peppard and Fulton Company of Superior, Wis., while the renewal of the north half during this last winter was done by railway forces under the supervision of H. J. Seyton, district engineer, and in direct charge of B. Hemstad, master carpenter.

When to Tamp New Ties

When renewing ties, should the new ties be tamped as they are inserted or the tamping be left until the day's allotment of ties has been inserted? Why?

Uniform Bearing Essential

By J. Morgan
Supervisor, Central of Georgia,
Leeds, Ala.

There are several ways of making tie renewals without raising the track, which is a condition implied in the question. Some prefer to insert the day's allotment, catching the new ties enough to bring them snugly against the rail, then drop back to smooth up, at this time full-tamping all ties that need it.

While this is a good way to make renewals, I believe that the most practicable method is, first, to draw the spikes from all ties that are to be removed, then bring the track to a smooth surface, after which the ties can be renewed and tamped as they are inserted. If the smoothing is done first, one is not bothered by the slight irregularities which result from springing the track to free the old tie and permit its easy removal, but which settle out under traffic, returning the track to its proper surface.

If the track is to be surfaced out of face, the tie renewals should be made as the track is raised, and all ties can be tamped at the same time. This will insure the uniform bearing for all ties, which is essential to good riding track.

May Be Called Away

By Henry Becker
Section Foreman, St. Louis-San Francisco,
Rush Tower, Mo.

It is my experience that ties should be tamped as they are inserted. One never knows when he may be called to other work of an emergency character. For this reason, he should, so far as practicable, keep his work in such shape that he will be able to leave it on a moment's notice and in condition to run without further attention until his return. In these days one does not have sufficient force to permit leaving two or three men to close up a job that is left hurriedly.

Untamped ties do not support the rail. While one may not be able to detect any damage from allowing trains to pass over untamped ties, such a practice subjects the rail to a form of abuse which should not be imposed upon it. Rails break even when given the best of care. When one allows them to be abused he is taking unwarranted chances, particularly when, as in this case, there are no offsetting advantages.

Keep Track Ready to Close

By L. A. Rape
Extra Foreman, Baltimore & Ohio,
Wampum, Pa.

It is always good practice to keep the tamping of new ties as close behind the insertions as practicable, whether the work is being done by a large extra gang or by a small section gang. This also applies with equal force where spot renewals are being made and where the renewals are made in connection with a general raise.

It is necessary sometimes to mobilize a large force to restore the track to operation as quickly as possible after a wreck, a washout, a slide, a fire, a sun kink or other form of disaster. When a gang gets an emergency call it is expected to respond at once, which it cannot do unless its work has been carried along systematically with a view to keeping the minimum amount of track open at any time.

When a tie is left untamped, the ties on either side of it must do the work it should have done, in addition to their own, causing a detrimental effect on the surface. Again, track in which many ties are left untamped tends to go out of line easily during the passage of trains.

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in October

1. *When going to a heavy rail section, say above 100 lb., is it practicable to adopt a wider tie spacing? If not, why? If so, how much?*
2. *What is the most practical way of taking soundings around trestle bents and masonry piers to determine whether scour is taking place?*
3. *When surfacing track, should the high or the low rail on a curve first be brought to surface? Why?*
4. *What is the best method of removing paint from plaster?*
5. *How should whitewash be made to get best results?*
6. *What is the purpose of a check valve in a discharge line? In a suction line? Where should it be located?*
7. *Is there any advantage in preboring ties for tie-plate lag screws? Any disadvantages? If so, what?*
8. *When it becomes necessary to support a weak girder span on falsework, what precautions should be observed? Why?*

Tamp At Once

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

By all means, ties inserted in main tracks for renewal should be tamped as soon as they are in place. Rail needs a uniform support to withstand present-day wheel loads. If the ties are tamped as inserted they will have a chance to compact the ballast by the time the foreman is ready to do his smoothing late in the day and there is less likelihood that he will have to go over it again the next day to pick up weak places. Again, track in which the ties are not tamped as they are inserted tends to get out of line during the passage of trains.

If a single tie has been removed and the new tie has not been tamped, it is unlikely that heavy rails will be bent during the passage of one or two trains, although a light rail might be. If two adjacent ties have been removed, it might not be safe to let trains over until the new ones have been tamped. In any event the probability that the rail will be bent will be greatly increased. Where several ties in a panel require renewal, the track will ride rough unless the new ties are tamped.

Even on the ground of self protection, a foreman should be alert to tamp and spike his ties, for if an accident should occur at the point where he is working, and the ties are found to be untamped and unspiked, he will immediately be put on the defensive, although this may not have been a factor in causing or increasing the severity of the accident. Furthermore, a section gang is always subject to emergency calls, many of which leave no time to correct errors of omission after they are received. The foreman is thus placed in the dilemma of being unable to respond promptly or of leaving his track open and possibly not in a safe condition.

Where dusting occurs, certain remedial measures can be taken which will either cure or mitigate the condition. If it is a new floor, keeping it saturated for a week or so may help. Mopping at frequent intervals with a rich neutral soap solution, without rinsing off the soap will in time fill the pores and tend to bind the surface. For more severe cases there are many good proprietary hardeners on the market or, where preferred, a hardener can be made from commercial materials. The most widely used are water solutions of magnesium fluosilicate and zinc fluosilicate. For the first application, a solution in the proportion of 1 lb. of zinc fluosilicate and 3 lb. of magnesium fluosilicate in 8 gal. of water can be used. For subsequent applications, the same quantities of fluosilicates should be dissolved in 2 gal. of water.

Generous applications should be made on clean, dry surfaces to insure good penetration. A sprinkling can and a mop are useful for this purpose. At least three to four hours should be allowed between applications. While two applications are usually effective, it may be necessary to give further treatments if the floor is in very bad condition. After the last application has dried thoroughly, the floor should be mopped to remove any incrustation that may have formed. It should never be lost sight of, however, that prevention is better than cure.

Why Do Concrete Floors Dust?

What causes concrete floors to dust? What can be done to overcome the trouble?

Poor Concrete

By A. J. Boase
Manager, Structural and Technical Bureau, Portland Cement Association, Chicago

The dusting of concrete floors is usually brought about by a combination of factors rather than from a single cause. Factors contributing to this condition may be any or all of the following: (1) The use of soft and dirty aggregates; (2) too much fine material; (3) too wet a mixture; (4) sand and cement spread on the surface to take up excess moisture; (5) excessive troweling while the mixture is soft; (6) lack of curing.

Almost all of us have seen a contractor spread out a mortar mixture that is so wet that it will almost level out by itself. After it has been screeded and allowed to stand for a few minutes, so much moisture will collect on the surface that it cannot be floated and troweled. To save time he will throw fine sand, cement or a mixture of the two on the surface to take up the water. Then when he trowels it he works still more fine material and water to the surface. This forms a soft coating on the surface and subsequent dusting is the result.

It will be seen, therefore, that the causes of dusting indicate the procedure necessary to prevent it. Clean, hard, coarsely graded aggregates should be used. Where the service is severe, as where heavily loaded steel tired trucks are used, it may be necessary to provide granite, trap rock or silica aggregate. The sand should consist chiefly of coarser grains ranging from $\frac{1}{16}$ to $\frac{1}{4}$ in. in size, with not more than 5 per cent passing a 100-mesh sieve and not more than 15 per cent passing a 50-mesh sieve. Fine sands should not be used and those containing large quantities of stone dust, clay or silt are particularly objectionable.

Then, instead of the usual mortar mix for topping, one containing coarse aggregate graded from $\frac{1}{8}$ to $\frac{3}{8}$ in. in size should be used. The proportions may be 1 part cement, 1 part sand and from $1\frac{1}{2}$ to 2 parts of the coarse aggregate. The mix should be as stiff as possible, which will require considerable effort to spread, screed and compact it. Preferably it should be rolled or tamped and then compacted with a mechanical float. No cement or sand should be added to the top surface after the mixture is spread. Troweling should be delayed as long as possible. As soon as the surface is hard enough so that it will not be damaged by flooding, it should be flooded or covered with wet sand or burlap and should be kept constantly wet for a week.

Concrete Must Be Dense

By General Inspector of Buildings

Strength and density are almost synonomous when applied to concrete. To prevent dusting, concrete must be dense, for which reason the requirements for strength must be met when making concrete for floors. In addition to the usual requirements for clean, properly graded aggregates, the aggregates for floors should be hard, relatively coarse and without fine material. A number of other precautions are also necessary if satisfactory results are to be obtained.

Concrete for a wearing surface should be as dry as possible, the total water content should not exceed about 35 per cent. This will make a stiff mixture that is difficult to handle and that must be spread by hand and then tamped or rolled into place. While the surface should be floated as soon as it has been placed, the troweling should be delayed as long as possible. Drenching the surface with water to facilitate floating or troweling, and the sprinkling of fine sand or cement over the surface should be prohibited. Concrete as stiff as this mixture does

not always trowel easily, and there is sometimes a tendency to do too much troweling, a matter that should be given close attention.

Rapid drying of the surface will cause dusting on an otherwise excellent job. To avoid this, as soon as the concrete has hardened enough to resist pitting when it is wet, the floor should be flooded with water and kept in this condition for 7 to 10 days, preferably the latter. This will increase its resistance to abrasion by at least 65 per cent. If it can be kept flooded longer, it will be still better.

Where these precautions have not been taken and the floor is subject to dusting, the trouble can sometimes be overcome by the use of ordinary water glass. Before making the application, the floor should first be swept as clean as possible and then scrubbed thoroughly with clean water and allowed to dry.

The solution is made by mixing one part of commercial water glass with three parts of water. Four applications should be made at intervals of 24 hours, scrubbing the surface with clean water and allowing it to dry before each application. As the sodium silicate (water glass) penetrates below the surface it reacts with the alkali in the concrete to form a very hard, insoluable mineral glue. After the last application the excess water glass remaining on the surface can be washed off easily.

Benefits from Killing Weeds

What benefits are derived from the destruction of weeds? What is the importance of each?

Keeps Ballast Clean

By T. M. Pittman
Division Engineer, Illinois Central, Water Valley, Miss.

Probably the most important damage caused by weeds and grass in the ballast section is the fouling of the ballast by collecting dirt and providing humus for further growth. This blocks the drainage and the cleaning or renewal of the ballast at more frequent intervals. Weeds also tend to hold moisture, which accelerates decay in the ties, especially if they are untreated. The roots of some species of grass force themselves into the small cracks in the ties and as they grow they open the cracks wider, again hastening decay.

As the weeds increase in size they interfere with the inspection of the track and must be removed, generally by hand where systematic weed destruction is not practiced, before track work can be done. Some weeds have hard stems and seeds which, if they get onto the top of the rail, cause locomotive drivers to slip. This condition is especially troublesome where it occurs on steep grades or at the entrance or leaving end of sidings.

Outside of the ballast section, the greatest objection to weeds is the fire hazard, which may be very serious at times. Fires started on the right of way by locomotive sparks or other causes may spread to adjoining property or damage bridges and other structures on the right of way. Heavy growths of weeds provide hiding places for material and much good as well as scrap material may be lost in the weeds and not recovered until they have been cut or die down in the fall.

Aside from the foregoing physical objections to allowing weeds to remain undestroyed, a clean track and right of way are an indication of good housekeeping and indirectly stimulate the men to more careful work, while, conversely, the presence of weeds and grass in the track tends to invite slovenly work. In general, the standard to which the track forces are working is reliably reflected in the appearance of the roadbed and right of way.

Weeds, the Enemy of Track

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Like water, weeds are the enemy of good track; in fact, in not a few cases they work hand in hand to cause weak places in the track and roadbed. They foul the ballast, interfering with its drainage; in ditches they retard the normal flow and increase the tendency toward sedimentation, thus creating soft spots in some instances, which might have been avoided by complete weed destruction.

Weeds interfere with track inspection, where heavy, and before the track forces can work at any point they must lose time to clear away the weeds that interfere with their work, always an expensive and non-productive operation. Since a heavy blanket of weeds tends to retain moisture, they may decrease tie life by increasing the rate of decay.

Weeds growing around the rail interfere with traction. Again, there is nothing that spoils the appearance of a railway as much as a heavy growth of uncut weeds. Such a sight gives an impression of shiftlessness that is not easily erased, and passengers complete their journey with the belief that the track maintenance is no better than the housekeeping. In addition, there is a decided fire hazard from weeds, whether through the mountains, in farming sections or across forest preserves.

These are only some of the disadvantages and hazards of allowing weeds to thrive in the ballast and roadbed and on the right of way. All of them can be eliminated by systematic and persistent weed destruction. It is difficult to evaluate them in the order of their relative importance, since an item which may be of great importance on one road or section of that road may be of less importance, relatively, on another.

Benefits Are Many

By L. A. Rape
Extra Foreman, Baltimore & Ohio, Wampum, Pa.

Weeds cause many ills to track and roadbed, as well as beyond these limits, and since all of them, so far as they arise from this cause, are eliminated by weed destruction, the benefits are many. Of first importance on any railroad, drainage must be maintained. Weeds growing in the ballast cause fouling and interfere with drainage. In ditches they likewise interfere with the runoff and tend to catch rubbish and plug cross drains, often being the primary cause of soft spots in the roadbed. More often than is admitted, failure to control or eliminate weeds has been the deciding factor in the need for ballast renewal.

Again, a prolific growth of weeds chokes out or discourages the growth of grass on the slopes of cuts and fills, a well sodded right of way being the ideal for which the maintenance forces should strive. Of secondary importance from the maintenance standpoint, but of considerable importance from the traffic viewpoint, is the question of appearance. A clean, neat roadbed and right of way make an appeal to passengers which cannot be ignored. Conversely, a weed-grown, slovenly right of way creates an adverse "impression" which doubtless will have an effect on revenue if allowed to continue for any length of time. Uncontrolled weed growth can-

not fail to react on the maintenance forces, for it is almost an axiom that good housekeeping and neat well-performed work go hand in hand, while poor housekeeping is an accompaniment of slovenly work.

Many Benefits

By H. E. Kirby
Assistant Cost Engineer, Chesapeake & Ohio, Richmond, Va.

Weed growth in the roadway section is of great economic importance, aside from its importance with respect to appearance and its possible effect on employee morale. The practical results derived from destroying weeds include the following: (1) Improves drainage; (2) reduces fouling of the ballast; (3) prolongs the life of ties, by retarding one process of decay; (4) facilitates inspection of the track and of its component parts; (5) reduces interference with traction; and (6) improves appearance.

No attempt has been made to place these items in the order of their relative importance, since no such classification is practicable, because conditions and controlling factors vary in different sections of the country, on different roads and even between main and branch lines of individual roads. Other variable factors also include soil, ballast, climate and species of weeds and grasses.

In addition to the foregoing, other benefits from weed destruction, which are of great importance to some roads are reduction of difficulties with snow, the lessening of fire hazards and the elimination of the influence of damp weeds on track circuits in automatic signal territory.

Making Sheet Piling Watertight

How can steel sheet piling be made watertight?

Term Is Relative

By P. G. Lang, Jr.
Engineer of Bridges, Baltimore & Ohio, Baltimore, Md.

The term watertight, when applied to steel sheet piling used in coffer dams and similar work, is relative. Manufacturers of such piling claim only that it is "practically watertight." Actually, there is almost invariably some leakage, although it is rarely of such volume as to make it impracticable to keep the area dry by the use of ordinary pumps.

While the uses of steel sheet piling are various, for the purpose of this discussion they may be classified in two general groups, namely, (1) where the piling will be exposed on one side, and (2) where it will not be thus exposed. Where one side is exposed, it is possible to get a watertight job by suitable welding procedure, that is, by running a light sealing weld along the joints as they are uncovered.

It is fitting to call attention here to the fact that in certain classes of structures it is known in advance that a watertight job will be required. In such a case, the entire enclosure should be surrounded with the sheet piling, driven lightly, that is, sufficiently to complete the enclosure and hold the piling in place. This is recommended in order that the closure can be made readily with a full section of the piling. After this, the piling should all be driven to their final elevation. The especial object of this procedure is to avoid awkward, expensive and leaky final closure.

To increase the watertightness of such a structure, in quite a few cases cinders poured down the interlockings have proved effective. Two other methods have been tried with success in certain locations, namely, partially filling the interlockings with a suitable bituminous compound before the piling are driven, or driving into the interlockings softwood strips which tend, first, to tighten the interlocks and, second, to swell and seal them when they come into contact with water. It has been suggested further that, in some cases, steel sheet piling can be made watertight by grouting the adjacent material, close to the surface of the piling.

Finds Cinders Effective

By G. A. Haggander
Bridge Engineer, Chicago, Burlington & Quincy, Chicago

One method, which we have not used extensively is to place wooden strips in the interlockings when the piling is driven. Our usual method, however, is to fill the open spaces of the interlocking with fine cinders and throw cinders or manure into the water around the coffer dam where they will be sucked into the leaks by the force of the current. When the coffer dam is jarred by additional pile driving or some outside shock, the leaks may open, in which case the process must be repeated until the leaks are again sealed. Before the sheet piles are driven the interlocking surfaces are usually oiled with black oil to prevent material from adhering to the steel and to insure easier pulling.

Surfacing Tight Rail

Where the rail is tight, what methods should be employed in surfacing track out of face? Why?

Should Not Be Tight

By Oscar Surprenant
Roadmaster, Delaware & Hudson, Schenectady, N. Y.

In the first place, rail should not be tight, but, unfortunately, it gets that way. This may be the result of improper laying—failure to provide the proper amount of expansion. Again, it may be that it was laid properly, but too few anti-creepers were applied, especially on certain stretches of track where, because of speed, grade, tonnage, frequent braking or other causes, the rail exhibits an undue tendency to creep.

Where rail is tight and the track must be surfaced out of face, the sane thing to do is first to apply sufficient anti-creepers, then cut rails at different points to equalize the expansion. This will avoid the necessity of bunting back the rail the full distance to the point from which it has crept, which requires a large number of men and consumes a large amount of unproductive time. From this point the surfacing can proceed in the normal manner, since the rail will be relieved of the strains resulting from bunching and temperature.

Depends on Why Tight

By L. L. Adams
Engineer Maintenance of Way, Louisville & Nashville, Louisville, Ky.

Tight rail may be placed in either of two categories: (1) Rail that is purposely laid tight and is held in

place by absolute anchorage by either using a sufficient number of anti-creepers or by employing specially designed fastenings such as the GEO or M & L types; and (2) Rail that has become tight through creepage.

In the first case, there should be no great danger in surfacing the track out of face, since the only stress in the rail is that set up by normal expansion. Care must be exercised in setting the jacks, however, to insure a direct vertical lift; otherwise the track will be thrown out of line. Sufficient ballast must also be available to fill the cribs, at least outside of the rail, to hold the track in line after it has been surfaced.

In the second case, the track should not be surfaced until the stress in the rail has been relieved by closing adjacent joints that have been opened as a result of the rail creepage. Where rail is tight for this reason, there is no way of knowing how much stress has been set up over that of normal expansion, for which reason it is dangerous to disturb the track in any way until the condition has been corrected.

Secure Proper Expansion

By E. L. Banion
Roadmaster, Atchison, Topeka & Santa Fe, Independence, Kan.

With our present rail-laying practices, using expansion shims in accordance with the temperature and applying sufficient anchors to eliminate rail creepage, there should be little, if any, trouble from rail that is too tight to be surfaced out of face at any time. This has not always been the situation, however, and we still have much tight rail left from the days when we were not so particular about making proper use of expansion shims.

At that time also, some who spoke with authority held to the idea that troublesome joint batter, loose bolts, low joints and other related ills could be eliminated by "taking the click out of the rails," that is, driving up all expansion openings. Rail was laid tight even during the winter months. It was almost impossible to surface this rail out of face without frequent sun kinks, which often occurred when the temperature was far below that prevailing during the summer months.

Track laid with tight rail presents a hazard, particularly if there is insufficient ballast or anti-creepers to prevent 'bunching." Under this combination of circumstances many trains have been derailed by reason of sun kinks developing under these trains at points where no work was being done on the track.

From past experience in surfacing track out of face where the rail was tight, I would see, first, that proper speed restrictions were placed to insure safe passage of trains while the track is open. I would then insist that the raise be made uniformly, that is, that there is no jerking of the jacks and that one side is not raised ahead of the other. After the track has been raised and tamped, I would fill in enough ballast to hold it in place before attempting to line it.

When raising tight rail, if the track shows any tendency to buckle, one should never attempt to line out the kinks until enough ballast has been thrown back to hold it in place. Many times, where this has not been done, in trying to reduce a small swing the effort has resulted in buckling track.

If the rail is so tight that none of the foregoing precautions are effective, the condition should be relieved permanently by inserting short rails and distributing the expansion. Since, in many instances, it is necessary to cease light repair work during the midday heat of the summer because the rail is tight, it seems logical from the standpoints of both safety and economy, to eliminate the condition once for all by securing the proper expansion openings before the out-of-face-surfacing is started.

Look for Frozen Joints

By L. A. Rape
Extra Foreman, Baltimore & Ohio, Wampum, Pa.

Not infrequently, rail is tight primarily because the joints are frozen. For this reason, the first thing to do is to look for open joints and, where found, loosen the bolts to allow the rail to expand. If still too tight, rails should be cut at intervals to equalize the expansion.

Where tight rail must be surfaced, it is important that there be sufficient ballast to fill the track after the raise has been completed, and in some cases it may be necessary to dump ballast before the surfacing is started. In making the lift, one should be certain that the jacks are set straight and that both railqs are raised together. If the track is to be given more than a light lift, say more than 2 in., it will be better to make two lifts, tamping and filling the track after each one. The inside tamping particularly should be kept immediately behind the jacks, so that the minimum amount of track will be loose at any time. The track should not be allowed to get out of line even slightly, for this will provide the opportunity for buckling, which the foregoing precautions are intended to avoid.

What Is Spotting on Paint?

What is spotting, as applied to paint surfaces? What can be done to prevent it? What factors affect this?

Loss of Natural Gloss

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

Spotting is a term used in describing paint which has developed faded spots or areas from which the natural gloss has disappeared, causing the surface to appear spotted. It is a condition which may be found on either wood or metal surfaces.

On wood surfaces it is sometimes due to soft or porous areas in the wood which absorb more of the oil from the paint film than is done by the remainder of the surface. It is also due sometimes to slight moisture in the wood, particularly if it is exposed directly to the heat of the sun while the paint is drying. More frequently, however, it is due to inferior paint or lack of care in application. First-grade white-lead paint, properly mixed and applied to a properly prepared surface, seldom shows this defect.

When painting a new wood surface, care should be exercised to insure that the surface is perfectly dry before the priming coat is applied. Furthermore, because few wood surfaces absorb the oil uniformly, the priming coat should contain enough oil thoroughly to fill all pores in the wood, so that succeeding coats will not be robbed of their oil; otherwise spotting will result. Spotting also appears sometimes on repainted surfaces because the hardness of the old

paint is not uniform, and in this instance it is better to apply two coats.

On metal surfaces, such as bridge girders, spotting is sometimes caused by the action of the direct rays of the sun on freshly applied red lead priming coats, or where such coats are exposed to alternate heat and cold before they are covered with the protective and finishing coats. Where metal surfaces are repainted, the same trouble may occur because of difference in absorption of oil by the old paint which is being covered.

Not Enough Oil

By General Bridge Inspector

While there are several kinds of spotting, most of them are of relatively rare occurrence. The one most commonly seen displays spots, or sometimes relatively large areas, in which the color is noticeably lighter than over the remainder of the surface. If these spots are examined, it will be noticed that the paint has lost its glossy surface and, if the condition is of long standing, that the paint has begun to chalk.

Spotting on wood surfaces occurs most frequently over and around nail holes and cracks. Where the afflicted area is larger, it will almost invariably be found to be over a section of the surface that is considerably more porous than the remainder. In other words, the underlying conditions are such that through absorption a part of the paint has been robbed of its oil. This diagnosis is confirmed by the fact that if the affected areas are touched up with clear linseed oil, the pain almost invariably returns to its original color. The exception is where the condition is of long standing and considerable of the pigment has been lost through chalking. Spotting on new surfaces is most likely to occur where only two coats have been applied, and on repainted surfaces where only one coat is applied.

Spotting occurs less often after the first painting of metal surfaces, because the metal has no power to absorb the oil. Bridges that have been repainted sometimes exhibit this phenomenon because the old paint was dry and had the capacity to absorb a considerable quantity of oil from the newly applied paint.

In this, as in many other cases, a knowledge of the cause suggests the remedy. The priming coat for wood should be relatively rich in oil. Sufficient turpentine should be used to insure thorough penetration of the surface and the paint should be well brushed in to force it into and fill the pores of the wood.

When repainting either metal or wood surfaces, particularly where the latter has shown evidence of spotting, the first coat should be rich in linseed oil and well brushed in to insure thorough absorption of the oil by the old paint film. If the old paint is dry and hard, it may be desirable to use more than the normal amount of turpentine to assure penetration of the oil into the old film.

Cutting a Rail in the Track

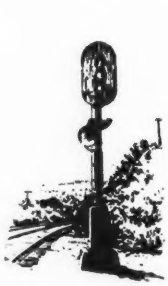
Under what conditions is it desirable to cut a rail without removing it from the track? How can it be done?

Cites An Easy Method

By J. Morgan
Supervisor, Central of Georgia, Leeds, Ala.

It is desirable to cut a rail while in the track when more time and expense will be involved in removing it. We find that we can cut rails in the track as easily and almost as quickly as if they were first removed for the purpose. Where we desire to remove only a part of a rail from the track without disturbing the remainder, as when necessary for a rail gang to make a closure for the passage of trains, we cut the old rail at the proper point without removing it from the track.

To do this, we remove the joint fastenings and pull the spikes from the part of the rail that is to be cut off. We then place three or four men with lining bars near the end of the rail and spring it laterally, enough to give it a stiff strain. The edge of the base is then nicked with a chisel which is struck one hard blow with a sledge. The bars are then reversed and the rail strained in the opposite direction. The chisel is then placed exactly opposite the first cut and is struck a sharp blow. A square, clean, break usually occurs at this time, but if it does not the process is repeated. If a clean break is desired, it is important that the chisel shall not be struck more than twice when making the first cut. Where the cut comes too close to the end of the rail to make it practicable to spring the rail, the joint should not be removed until after the cut is made. In this way the necessary strain can be obtained by using the adjacent rail for obtaining the needed leverage.



Does Not Favor Practice

By Robert White
Extra Foreman, Grand Trunk Western, Pontiac, Mich.

In many years of track experience I have never known a case where it was desirable to cut a rail without removing it from the track. I have seen cases, however, where it might have been more convenient to do so. While a cut can be made with an acetylene torch, the necessary equipment is seldom available, besides which the burned rail end is brittle and may break under traffic.

The common method is to pull the inside spikes up to the point of cut and force the free end of the rail in with lining bars. The edge of the base is then nicked with a chisel. A fair break is sometimes obtained, but more often a poor break. My particular objection is, however, that the practice is not safe. Considerable force on the lining bars is necessary and, as no one knows when the rail will snap, one or more of the men may fall and be injured. The use of a rail bender gives about the same results as are obtained with lining bars, but consumes more time. It is my belief that in the long run it is better to remove the rail from the track and cut it in the good old-fashioned but safe way.

Chisel Must Be Sharp

By O. A. Nay
Extra Gang Foreman, New York, Chicago & St. Louis, Delphos, Ohio

It is better to cut a rail without removing it from the track under any conditions where a part of it is to remain in the track. To do so saves the time of removing and replacing one joint and of pulling the spikes involved, plugging the holes and redriving the spikes.

To cut the rail one only needs a

chisel and sledge. The chisel must be sharp with a thin bit, and the sledge should weigh not less than 12 and preferably 16 lb. First, mark the rail on the inside edge of the base, the deeper the cut the better, letting the cut run out gradually at the fillet between the base and web. In warm weather the rail should be chilled by pouring cold water on the cut. The first tie beyond the cut should be well spiked and five or six men with lining bars should be placed as far from the cut as practicable—15 ft. is the best distance—to push the rail out far enough to put a heavy strain in it. The chisel is then placed on the outside of the rail on the fillet between the web and base, and exactly opposite the first cut. One to three sharp blows of the sledge will then cause the rail to snap with a break almost as clean as if it had been sawed entirely through.

This is an excellent method for making closure for the passage of trains when laying rail on single track, since it is dependable and can be done so quickly. After a gang has made a few cuts in this manner, it can complete a cut in from 45 sec. to 1½ min. from the first blow on the chisel.

Cause of Chattering in a Valve

What causes chattering in a valve? What can be done to prevent it? Does chattering affect the accuracy of water meters? Why?

Worn Parts

By Engineer of Water Service

In general, chattering is more likely to occur in faucets than in other types of valves. This extremely annoying defect is caused by the vibration of loose or worn parts, which indicates one of the reasons why faucets are more subject to chattering than other valves, since they are usually opened and closed oftener. In not a few instances the trouble can be traced to the use of fixtures of an inferior grade or poor design, of which a multitude are on the market.

Basically, a faucet is a relatively simple device with few parts, yet it is really astonishing how many variations of this basic design are being manufactured and how complicated some of them are. Assuming that the design is satisfactory and the workmanship is first class, it can usually be taken for granted that the simple design will be less likely to give trouble from chattering and that maintenance will be less difficult, since there are less parts to wear.

One should not overlook the fact, however, that a faucet that may be well fitted for one service may be completely unsatisfactory when used in some other service. For this reason, faucets, and this applies to other types of valves as well, should be selected with judgment for the particular service they are to perform, remembering also that in some installations they may be subject to considerable abuse. If this is done and they are obtained from reliable manufacturers, instead of "buying on price," both the trouble from chattering and the amount of maintenance required to keep them in good operating condition will be reduced to the minimum.

Chattering should have no effect on the accuracy of a water meter. Meters are displacement devices which are not affected by the pressure of the water or by changes in pressure. They are actuated entirely by the volume of water passing through them, for which reason the chattering of a valve will have no influence on the accuracy with which this measurement is made.

Does Not Affect Meters

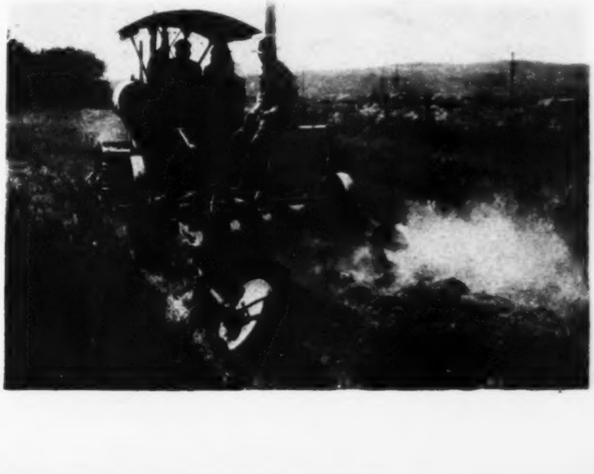
By Water Service Inspector

Probably no other feature of a plumbing or water-supply installation in buildings where persons are working, or where patrons are served, is so annoying as the chattering of valves, and few are more useless or inexcusable. Chattering is almost invariably caused by worn or otherwise loose parts in valves and faucets, which are set in vibration as water flows through them. As an immediate measure of relief, the worn or loose parts should be replaced or tightened. If this is not practicable without removing the valve to the shop, it should be replaced and repaired.

As a more permanent form of relief, a check should be made to determine whether the valves or faucets, generall the latter, are being subject to abuse or undue wear. If not, it might be well to inquire whether they are of the proper quality, for there are many inferior grades on the market and a poorly designed or constructed fitting can seldom be kept in good condition.

Chattering should be classed with water hammer so far as its effect on the accuracy of water meters is concerned. Water meters are of two types, those which accomplish measurement by displacement and those in which reaction wheels are set in the current and revolve with the movement of the water through the meter. In both cases, the measurement is based entirely on the volume of water passing through the meter and not on the pressure or lack of pressure in the pipe.

Water hammer is the shock arising from a sudden stoppage of flow of water in a pipe line, and results from the excessive pressure which is created by this stoppage until the energy of the moving column of water has been dissipated. On a small scale, chatter acts like water hammer with this difference—it consists of a series of small shocks synchronizing with the flutter of the worn part of the valve, instead of a single heavy shock or a series of diminishing shocks as the energy is dissipated, which continue as long as the flow through the valve or faucet is continued. It will be seen, therefore, that since water hammer and chattering do not affect the volume of water passing through the meter, but only the pressure, they have no effect on the accuracy of the meter.



Plowing a Fire-Break Along the Great Northern in Montana

Equipment Orders Best Since 1930

With orders for 122 locomotives, 26,560 freight cars and 107 passenger-train cars placed during the first six months of this year, the railway equipment market attained a greater degree of activity than during any similar period since 1930. Freight car orders placed during the first six months of this year were in excess of those for the entire 12 months of any year since 1930 and the same is true of orders for steam locomotives. Orders placed for passenger cars during the first half of this year were in excess of those for the entire 12 months of any of the five prior years except 1934.

New Streamlined Train For New York Central

On July 15, the New York Central placed in service between Cleveland, Ohio, and Detroit, Mich., a completely streamlined steam train, known as the Mercury, which will operate between these cities on a schedule calling for an average speed of 57.9 miles per hour for the 164 miles each way. The new train, which consists of seven coaches, two of which are fitted for Pullman parlor car service, is drawn by a K5 Pacific type locomotive which is streamlined and decorated in such a manner as to make it an integral part of the train. Outstanding features of the train include the use of new types of interior facilities so arranged as to avoid the corridor-like appearance characteristic of the interior of long passenger cars; the use of a special type of coupling between cars that does away with shocks due to starting and stopping; and unique architectural treatment of both the exterior and interior of the train.

Travel Up on Both Eastern and Western Lines

Additional passenger traffic and increased revenues, attributable to the lower passenger fares which went into effect on the eastern lines on June 1, have prevailed on those lines since that date, according to reports of the individual carriers. The gains in passenger revenue in June as compared with the same month of 1935 ranged from 6.3 per cent on the New York Central to 26 per cent on the Baltimore & Ohio, while gains in the number of passengers carried ranged up to as high as 50 to 75 per cent on the Delaware, Lackawanna & Western. Passenger travel over the July 4 holiday was particularly encouraging and was reported by passenger traffic officers as being "tremendous" in volume. The western lines, on which reduced fares have been in effect for several years, have also reported that travel in the west so far this year has exceeded that for the same period in 1935 and that the number of passengers carried during the July 4 holiday was greater than for several years.

Expect Car Loadings To Increase Further

Railroad freight car loadings during the third quarter of the year will be 10.7 per cent greater than the loadings for the similar quarter of 1935, according to estimates compiled by the 13 shippers' regional advisory boards and consolidated by the Association of American Railroads. The largest increase (15 per cent) is expected to take place in the Northwest region, although increases of 14.1 per cent are expected in both the Allegheny and the Great Lakes regions. The smallest increase (2 per cent) is anticipated for the New England region. Increases are expected to take place in loadings of all but three of the 29 principal commodities included in the estimates.

Tax Act for Pension Funds Held Invalid

In a recent decision Justice Jennings Bailey of the federal district court for the District of Columbia declared unconstitutional the tax act which Congress passed in 1935 providing for the taxing of the railroads as a means of obtaining funds for the payment of pensions under the railroad retirement act which was passed at the same time. Justice Bailey held that the two acts are "so inter-related and interdependent that each is a necessary part of one entire scheme" and that the tax act was an attempt by Congress to accomplish under its taxing power a compulsory pension plan which the Supreme Court had held it had no power to impose. In the latter statement Justice Bailey referred to a previous decision holding unconstitutional the railroad retirement act passed by Congress in 1934. He added, however, that his order was not intended to prevent the Railroad Retirement Board from paying pensions out of the general funds of the government, as the act had authorized the appropriation of such money from time to time out of the treasury of the United States as might be necessary to carry it into effect.

Following the decision of the district court, the federal government announced that it would pay from its own funds the retirement annuities provided for in the railroad retirement act to those who are eligible and who are willing to retire and take the chance that the payments will be continued after the act has been passed upon by the Supreme Court.

Travelers Questioned on Air Conditioning

In connection with an exhaustive investigation of air-conditioning now being conducted by the Equipment Research Division of the Association of American Railroads, the traveling public is being asked to submit its views on the efficiency of the air conditioning equipment now in use on passenger trains. Through the agency of a questionnaire which is being distributed to passengers by research engineers, inquiry is being made as to whether, in the opinion of the passenger, the car or train is too warm or too cool; if it is "clammy," stuffy, drafty or noisy, or possibly too cool upon entering. Passengers are also being asked whether there are any objectionable odors, evidence of smoke when passing through tunnels, excessive tobacco smoke and, if occupying a berth in a sleeping car, whether it is too warm or too cool or is sufficiently ventilated.

Second Annual Railroad Week

The second annual railroad week, held this year during the week of July 13-18, was featured by a wide variety of activities, ranging from a handcar "derby" in Chicago to the selection of a railroad "queen of queens." Inaugurated in 500 cities and towns on July 13 by the blowing of 18,000 railroad whistles, the week was characterized by a rapid procession of special events designed to make the public railroad conscious. The introduction this year of a personality contest for women employees of the railroads was designed especially to appeal to feminine patronage. As the result of contests held throughout the west, with the final judging taking place at Chicago, Marybeth McGurk, 18, a stenographer on the Chicago & Eastern Illinois, was chosen queen.

Numerous prominent men identified with the railroads delivered addresses before various gatherings. One such meeting of the Chicago Chamber of Commerce was featured by telegraphic communication with coincident chamber of commerce meetings throughout the country, the telegraph keys being manned by prominent rail executives who at one time were telegraph operators. Other activities of the week included a train criers' contest which was held at the Wrigley baseball field, Chicago, a foot race between redcaps each carrying four suitcases weighing a total of 60 lbs., and a handcar "derby," all these events being presented at Chicago. The course for the handcar race consisted of a ½-mile stretch of street car tracks on Franklin street. It was won by a Chicago & North Western crew, while a crew of the Chicago, Milwaukee, St. Paul & Pacific placed second, and that of the Minneapolis, St. Paul & Sault Ste. Marie came in third. Railroad week was climaxed on July 18 by picnics and parades. At Chicago more than 15,000 employees, together with floats and drum and bugle corps, paraded through the downtown section.

Association News

National Railway Appliances Association

The Association now has seventy-nine members, the largest number to be enrolled at this season for many years. Of these, seventy have already signified their intention to participate in the March exhibition. The present prospect is, therefore, that considerably more space will be taken than last year or the year before. The board will hold a meeting on August 4 to pass on plans and take such other action as is necessary to prepare for the March appliances show. The finances of the association are in such excellent condition that the membership fees have been reduced 30 percent.

Bridge and Building Association

A meeting of the executive committee was held in Chicago on July 11, with Vice-Presidents E. C. Neville, F. H. Masters and C. A. J. Richards, Secretary-Treasurer C. A. Lichty and Directors R P. Luck and W. R. Roof, present, together with Past Presidents C. R. Knowles and Elmer T. Howson. W. S. Carlisle, National Lead Company, was also present, as secretary of the Bridge and Building Supply Men's Association. The meeting was devoted primarily to the formulation of the program for the annual convention which will be held at the Hotel Stevens, Chicago, on October 20-22. Reports of three of the committees were presented in tentative form and discussed in detail. Tentative plans were made for an inspection of the plant of the Johns-Manville Company at Waukegan, Ill., on Thursday afternoon following the close of the convention.

American Railway Engineering Association

J. E. Armstrong, assistant chief engineer, Canadian Pacific, has been appointed chairman of the Special Committee on Complete Roadway and Track, to succeed J. V. Neubert, chief engineer maintenance of way, New York Central, whose appointment to the chairmanship of the Committee on Rail was noted in the July issue.

W. T. Dorrance, assistant to chief engineer, New York, New Haven & Hartford, has been appointed chairman of the Committee on Personnel of Committees of the Board of Direction, to succeed J. V. Neubert, who has assumed the chairmanship of the Committee on Rail.

The Association of American Railroads has appropriated $15,000 to be spent over a period of two years as its contribution to the joint study of boilerfeed water. The joint committee which is making this study is comprised of representatives of the American Water Works Association, the American Society of Mechanical Engineers, the Edison Electric Institute, the American Society for Testing Materials, the American Railway Engineering Association, the American Boiler Manufacturers' Association and the United States Navy.

A. J. Bühler, chief bridge engineer, Swiss Federal Railways, Berne, Switzerland, has been designated to represent the A.R.E.A. at the second congress of the International Association for Bridge and Structural Engineering, which will meet at Berlin, Germany, on October 1 to 11, 1936.

Eight committees held meetings during July, including Water Service, Fire Protection and Sanitation, at Atlantic City, N.J., on June 30 and July 1, in connection with the annual meeting of the American Water Works Association; Iron and Steel Structures, at Syracuse, N.Y., on July 8 and 9; Rail, at Chicago, on July 9; Buildings, at Chicago, on July 9 and 10; Economics of Bridges and Trestles, at Chicago, on July 11; Yards and Terminals, Cleveland, Ohio, on July 13; Maintenance of Way Work Equipment, at Chicago, on July 14; and Track, at Cleveland, Ohio, on July 22.

So far, only two committees have definitely scheduled meetings for August, these being Records and Accounts, at Boston, Mass., on August 5 and 6; and Masonry at Harrisburg, Pa., on August 6 and 7.

Roadmasters Association

The program for the fifty-first annual convention which will he held at the Hotel Stevens, Chicago, on September 15-17, is rapidly rounding into form. This program as arranged to date is as follows:

Tuesday, September 15
Morning Session

Convention called to order 10 a.m.
Invocation
Opening address by Harry G. Taylor, chairman, Western Association of Railway Executives, Chicago
Greetings from the American Railway Engineering Association
Greetings from the American Railway Bridge and Building Association
Address by President Armstrong Chinn, chief engineer, Alton, Chicago
Report of Committee on the Use of Work Equipment to Secure the Greatest Economy in Track Maintenance—R. W. Grigg, chairman; assistant supervisor, Penna., Derry, Pa.

Afternoon Session

Address on Taking Accidents Out of Track Work, by E. A. Meyer, chairman, Safety Section, A.A.R., and manager safety department, C.M. St.P. & P., Chicago
Report of Committee on the Selection and Training of Foreman, by G T. Anderson, chairman; roadmaster, K.C.S., Pittsburg, Kan.
Address on Building a Maintenance Organization
Adjournment to visit exhibit of Track Supply Association

Wednesday, September 16
Morning Session

Address on Getting the Most from Crossties, by R. S. Belcher, manager treating plants, A.T. & S.F., Topeka, Kan.
Report of Committee on the Inspection of Rail, C. W. Baldridge, chairman; assistant engineer, A.T. & S.F., Chicago
Address on Rail Maintenance, a Roadmaster's Problem, by C. B. Bronson, inspecting engineer, N.Y.C., New York

Afternoon Session

Report of Committee on Preparing and Maintaining Track for High Speed Operation, Walter Lakoski, Chairman; division engineer, C.M.St.P. & P., Milwaukee, Wis.
Address on Meeting Tomorrow's Requirements for Speed, by H. R. Clarke, engineer maintenance of way, C.B. & Q., Chicago
Question Box. Questions submitted by members will be presented for discussion
Adjournment to visit exhibit of the Track Supply Association

Evening

Annual dinner given by the Track Supply Association

Thursday, September 17
Morning Session

Report of Committee on Rail Lubricators, H. E. Kirby, chairman; assistant cost engineer, C. & O., Richmond, Va.
Business session. Election of officers, selection of 1937 convention city, etc.

On Thursday afternoon the members will inspect the steel plant of the Carnegie-Illinois Company at Gary, Ind., where opportunity will be afforded to witness the rolling of rails, including the normalizing of the rails and the heat treating of rail ends. The party will leave Chicago on a New York Central train at 12:20.

The Track Supply Association

Fifty-nine companies have already taken membership and arranged for space in the exhibit of The Track Supply Association, which will be held at the Hotel Stevens, Chicago, on September 15-17, coincident with the convention of the Roadmasters and Maintenance of Way Association. Although it is still six weeks before the exhibit, this is a considerably larger number of companies than exhibited last year. Further applications for space should be addressed to Dan J. Higgins, secretary-treasurer of this organization, 332 South Michigan Avenue, Chicago.

The companies which have arranged for exhibition space to date are as follows:

Rir Reduction Sales Company, New York
American Chain Company, Bridgeport, Conn.
American Fork & Hoe Company, Cleveland, Ohio.
American Hoist & Derrick Company, St. Paul, Minn.
Austin-Western Road Machinery Company, Aurora, Ill.
Barco Manufacturing Company, Chicago
Blatchford Corporation, Chicago
The Buda Company, Harvey, Ill.
Carnegie-Illinois Steel Corporation, Pittsburgh, Pa.

Chicago Pneumatic Tool Company, New oYrk
Chipman Chemical Company, Boundbrook, N. J.
Cleveland Tractor Company, Cleveland, Ohio
The Creepcheck Company, Inc., Chicago
Crerar Adams & Company, Chicago
Cullen-Friestedt Company, Chicago
A. P. DeSanno & Son, Inc., Chicago
Duff Norton Manufacturing Company, Pittsburgh, Pa.
Eaton Manufacturing Company, Massillon, Ohio
Electric Tamper & Equipment Company, Ludington, Mich.
Evans Products Company, Detroit, Mich.
Fairmont Railway Motors, Inc., Fairmont, Minn.
Gardner Denver Company, Quincy, Ill.
Hubbard & Company, Pittsburgh
Illinois Malleable Iron Company, Chicago
Industrial Brownhoist Corporation, Bay City, Mich.
Ingersoll-Rand Company, New York
Inland Steel Company, Chicago
O. F. Jordan Company, East Chicago, Ind.
Kalamazoo Railway Supply Company, Kalamazoo, Mich.
Keystone Grinder & Manufacturing Company, Pittsburgh, Pa.
Lima Locomotive Works, Inc., Lima, Ohio
Lundie Engineering Corporation, New York
Maintenance Equipment Company, Chicago
Mall Tool Company, Chicago
Morden Frog & Crossing Works, Chicago
National Lock Washer Company, Newark, N. J.
National Refining Company, Cleveland, Ohio
Nordberg Manufacturing Company, Milwaukee, Wis.
Northwestern Motor Company, Eau Claire, Wis.
Norton Company, Worcester, Mass.
Oxweld Railway Service Company, Chicago
P & M Company, Chicago
Positive Rail Anchor Company, Chicago
Q & C Company, New York
Rail Joint Company, New York
The Rails Company, New York
Railway Engineering and Maintenance, Chicago
Railway Equipment & Publishing Company, New York
Railway Track-Work Company, Philadelphia, Pa.
Ramapo-Ajax Corporation, New York
Republic Steel Corporation, Youngstown, Ohio
Sellers Manufacturing Company, Chicago
Teleweld Company, Inc., Chicago
Templeton Kenly & Company, Ltd., Chicago
The Texas Company, New York
Toncan Culvert Manufacturers Association, Youngstown, Ohio
Warren Tool Corporation, Warren, Ohio
Western Railroad Supply Company, Chicago
Woodings-Verona Tool Works, Verona, Pa.

Personal Mention

General

J. Davis, district engineer of the Southern district of the Missouri Pacific, with headquarters at Little Rock, Ark., has been appointed superintendent of the Arkansas division, with the same headquarters.

W. O. Frame, district maintenance engineer of the Central district of the Chicago, Burlington & Quincy, with headquarters at Burlington, Iowa, has been appointed assistant superintendent with headquarters at Wymore, Neb.

C. E. Weaver, general manager and chief engineer of the Central of Georgia until he left this company in 1933 to become southern regional director on the staff of the federal co-ordinator of transportation, has returned to the service of the Central of Georgia as general manager. **R. R. Cummins,** who has served as general manager and chief engineer during Mr. Weaver's absence has been appointed assistant general manager, a newly-created position.

Robert B. Ball, assistant chief engineer of the Atchison, Topeka & Santa Fe System, with headquarters at Chicago, has been appointed assistant general manager of the Gulf, Colorado & Santa Fe (part of the Santa Fe System), with headquarters at Galveston, Tex. Mr. Ball has been associated with the Santa Fe for about 32 years. He was born on December 17, 1880, in Randolph county, Mo., and obtained his higher education at Leland Stanford university, from which he was graduated in 1904. Previous to his graduation from college, Mr. Ball served for a year in the engineering department of the Coast lines of the Santa Fe. In 1904 he re-entered the service of this company as an instrumentman, being advanced to division engineer in 1910. Two years later Mr. Ball was promoted to district engineer, with headquarters at Los Angeles, Cal., and in 1918 he was further promoted to chief engineer of the Coast lines, with the same headquarters. In 1929 he was sent to Chicago as assistant chief engineer of the system, which position he held until his recent promotion to assistant general manager of the G.C. & S.F., which was effective on July 1.

Robert B. Ball

Robert M. White, superintendent of the Morris and Essex division of the Delaware, Lackawanna & Western, and formerly a division engineer on this road, who has been appointed assistant to the general superintendent, with headquarters as before at Hoboken, N.J., as noted in the July issue, entered railroad service in 1894 as a chainman in the maintenance of way department of the Susquehanna division of the Erie at Elmira, N.Y. Subsequently he served as assistant engineer and supervisor, leaving the Erie in 1900 to become an assistant engineer for the Mexican Coal & Coke Company. Mr. White entered the service of the Lackawanna in 1901 as assistant engineer on the Buffalo division at Dansville, N.Y., and was promoted to resident engineer and roadmaster at Buffalo later in the same year. On September 1, 1908, he was promoted to division engineer of the Scranton division at Scranton and on September 16, 1911, became superintendent of the Bangor and Portland division, with headquarters at Easton, Pa. He continued in that position until October, 1917, when he was granted a furlough to serve in the World War, being assigned to the construction division of the army. In August, 1919, Mr. White returned to the Lackawanna as superintendent of the Bangor and Portland division and on March 1, 1920, he was transferred to the Morris and Essex division.

Robert M. White

Duncan J. Kerr, assistant to the president of the Great Northern, and an engineer by training and experience, who has been appointed assistant to the president of the Lehigh Valley, with headquarters at New York, as announced in the July issue, was born on December 3, 1883, at Glasgow, Scotland, and was graduated from the University of Glasgow in 1904 with the degree of Bachelor of Science in Civil Engineering. He entered railway service in November, 1904, with the Pennsylvania and in 1909 went with the Chicago, Milwaukee & Puget Sound (now

the Chicago, Milwaukee, St. Paul & Pacific). From 1910 to 1913 Mr. Kerr served with the Oregon Trunk and the Spokane, Portland & Seattle. He entered the service of the Great Northern in 1913 and subsequently became office engineer, corporate engineer and assistant to the vice-president in the executive department. On December 1, 1920, Mr. Kerr was appointed assistant to the vice-president in charge of operation, which position he held until his recent appointment as assistant to the president of the Lehigh Valley. Mr. Kerr also served as president of the Cottonwood Coal Company and the Somers Lumber Company, subsidiaries of the Great Northern, from 1927 to May, 1936.

Duncan J. Kerr

Clifford S. Leet, land agent for the Bessemer & Lake Erie, and formerly an assistant engineer on this road, who has been appointed assistant general manager, with headquarters at Pittsburgh, Pa., as announced in the July issue, was born at Conneautville, Pa., and was educated at Allegheny College, Meadville, Pa., from which he was graduated in 1899. He entered railroad service on January 10, 1901, with the Erie, at Meadville. From January 15, 1903, to May, 1906, he served as an instrumentman for the Bessemer & Lake Erie and from the latter date until June, 1913, he was an assistant engineer on that road. From June, 1913, to December 31, 1914, he was on special assignments for the B. & L.E., and on January 1, 1915, he became land agent for that road and the Union Railroad, which position he held at the time of his recent appointment as assistant general manager.

Clifford S. Leet

Daniel M. Driscoll, superintendent on the Northern Pacific at Missoula, Mont., and formerly a roadmaster on this road, who has been appointed assistant to the operating vice-president, with headquarters at St. Paul, Minn., as reported in the July issue, has been connected with this company for nearly 35 years. He was born on February 22, 1878, at Manitowoc, Wis., and received his higher education at the University of Wisconsin. He entered the service of the Northern Pacific on September 20, 1901, as a chainman in the engineering department, later serving successively as a rodman, transitman and construction and locating engineer. In 1910 he was appointed roadmaster, which position he held until 1916, when he was advanced to trainmaster. Three years later, Mr. Driscall was further promoted to assistant superintendent, being advanced to assistant to the general superintendent in 1920. Eight years later he was appointed division superintendent, which position he held at various points until his recent promotion to assistant to the operating vice-president, effective June 1.

Daniel M. Driscoll

Engineering

Effective June 16, the departments heretofore reporting to **W. L. Seddon,** chief consulting engineer of the Seaboard Air Line, who has retired, as reported in the July issue, were transferred to the jurisdiction of **W. D. Faucette,** chief engineer.

G. E. Yahn, roadmaster on the Chicago, Burlington & Quincy at Galesburg, Ill., has been appointed district engineer maintenance of way of the Central district, with headquarters at Burlington, Iowa, to succeed **W. O. Frame,** whose appointment as assistant superintendent is noted elsewhere in these columns.

B. W. Wheelwright, office engineer of the Central region of the Canadian National, with headquarters at Toronto, Ont., has been promoted to engineer maintenance of way of the Central region, with the same headquarters, to succeed **E. G. Hewson,** who has been appointed office engineer.

H. F. Sharpley, assistant chief engineer of the Central of Georgia, with headquarters at Savannah, Ga., has been promoted to chief engineer, succeeding to a portion of the duties of **R. R. Cummins,** general manager and chief engineer, whose appointment as assistant general manager is noted elsewhere in these columns.

A. B. Chaney, division engineer of the Missouri and Memphis divisions of the Missouri Pacific, with headquarters at Poplar Bluff, Mo., has been appointed district engineer of the Southern district, with headquarters at Little Rock, Ark., to succeed **J. Davis,** whose appointment as superintendent of the Arkansas division is noted elsewhere in these columns. **C. J. Jaeschke,** roadmaster of the St. Louis Terminal division, has been appointed division engineer of the Missouri and Memphis divisions at Poplar Bluff, to succeed Mr. Chaney.

J. L. Starkie, office engineer in the office of the chief engineer of the Gulf, Colorado & Santa Fe (part of the Santa Fe System), at Galveston, Tex., has been promoted to district engineer of the Eastern district of the Eastern lines of the Santa Fe, with headquarters at Topeka, Kans., succeeding **Gilbert J. Bell,** who has retired at his own request.

Mr. Bell had been connected with the Santa Fe for nearly 50 years. He first entered railway service in 1881 as a chainman on the Peoria & Farmington (now part of the Minneapolis & St. Louis), later serving successively as a rodman and assistant engineer. In 1885 he went with the Iowa Central (now also part of the Minneapolis & St. Louis) as an inspector and transitman on the construction of this company's bridge across the Mississippi river at Keithsburg, Ill. In 1886, Mr. Bell was appointed an assistant engineer on this road at Keithsburg, and in the following year he went with the Union Pacific as an assistant engineer on the construction of its bridge across the Missouri river at Omaha, Neb. Later in the same year Mr. Bell entered the service of the Santa Fe as an assistant engineer on the construction of the

Gilbert J. Bell

Missouri river bridge at Sibley, Mo. Following the completion of this bridge, Mr. Bell served successively as assistant engineer in charge of river protection work on the Missouri river, erection of bridges over the Canadian river near Purcell, Okla., and over the Cimarron river near Guthrie, Okla., the construction of a dam for a reservoir at Thatcher, Colo., and the construction of bridges on the Western and New Mexico divisions. In 1908 he was advanced to division engineer of the Missouri division, with headquarters at Marceline, Mo., and from 1911 to 1915, while serving as division engineer at Marceline, he was connected with the reconstruction of the Missouri river bridge at Sibley. In 1915 he was advanced to district engineer of the eastern district of the Eastern lines, with headquarters at Topeka, Kan., which position he held until his recent retirement. Mr. Bell has specialized in river bank protection and channel diversion on the Missouri river and other streams, in the construction of bridges and bridge foundations, in the design of roadbed drainage systems and in the correction of landslides. During recent years he had supervision over general maintenance matters.

Asa H. Morrill, acting chief engineer of the Boston & Maine and the Maine Central, has been appointed chief engineer of these roads, with headquarters at Portland, Me., and Boston, Mass. Mr. Morrill was born at Concord, N. H., on October 7, 1870, and was graduated from the Massachusetts Institute of Technology in 1892. He entered the service of the New York, New Haven & Hartford in June of the later year, serving consecutively to January 19, 1906, in various positions from clerk to roadmaster in the maintenance of way department. From June 16, 1906, to January 19, 1907,

Asa H. Morrill

he served as draftsman on the same road, being appointed assistant engineer of construction on the latter date. On February 1, 1913, Mr. Morrill was appointed engineer of construction and valuation engineer of the Maine Central and Portland Terminal Company, serving in this capacity until his appointment as chief engineer of the Maine Central in March, 1928. In 1933 Mr. Morrill was appointed assistant chief engineer of the Maine Central and the Boston & Maine and he has been acting chief engineer of these roads since April of this year.

S. J. Polson, assistant track supervisor of the New York, New Haven & Hartford, with headquarters at Framingham, Mass., has been appointed assistant division engineer of the Providence division, with headquarters at Providence, R.I., to succeed **J. B. Bell,** who has been transferred to the Boston division, with headquarters at Boston, Mass. Mr. Bell succeeds **A. A. Cross,** who has been appointed office assistant in the office of the engineer maintenance of way at New Haven.

W. F. Petteys, whose promotion to assistant division engineer on the Western district of the Erie, with headquarters at Salamanca, N. Y., was noted in the July issue, was born on February 7, 1902, at Depew, N.Y. He received his higher education at the Rensselaer Polytechnic Institute, from which he was graduated in 1925. He entered railway service on May 2, 1926 as a temporary transitman on the Buffalo division of the Erie, with headquarters at Buffalo, and on November 1 of that year was promoted to transitman. On April 15, 1928, he was promoted to chief of corps on the same division, and on March 15, 1932, was transferred to the Wyoming division, with headquarters at Scranton, Pa. On November 1, 1932, he was promoted to maintenance inspector on the Jefferson division, with headquarters at Dunmore, Pa., and on December 7, 1934, he was appointed general yard foreman on the Susquehanna division with headquarters at Susquehanna, Pa. On February 11, 1936, he was transferred to the New York division, with headquarters at Port Jervis, N. Y., where he was located at the time of his recent promotion to assistant division engineer at Salamanca.

Changes on the Rock Island

W. H. Hillis, assistant superintendent of the La Crosse division of the Chicago, Burlington & Quincy, at North La Crosse, Wis., has resigned to become engineer maintenance of way of the Chicago, Rock Island & Pacific, with headquarters at Chicago. Mr. Hillis succeeds **F. T. Beckett,** who has been appointed assistant chief engineer with headquarters as before at Kansas City, Mo. These appointments became effective on July 1.

Mr. Beckett has served on various western lines for nearly 40 years. He was born on October 2, 1870, at Frankfort, Kan., and entered railway service on March 23, 1897, as a chainman on the Atchison, Topeka & Santa Fe, later serving as a rodman and instrumentman on this road. In April, 1900 he went with the Chicago, Burlington & Quincy as an assistant engineer on double track construction in western Iowa, leaving this company in June, 1902, to return to the Santa Fe as an assistant engineer on construction in New Mexico. On January 1, 1903, he was advanced to division engineer at San Marcial, N. M., and from September, 1906, to March, 1908, he served as an assistant engineer on construction and location in Oklahoma and New Mexico. From March 1, 1908, to November 1, 1913, he was with the El Paso & Southwestern (now part of the Southern Pacific) as a resident engineer. At the end of this period he entered the service of the Rock Island as engineer maintenance of way of the Second dis-

Frank T. Beckett

trict at El Reno, Okla., and in 1932 he was advanced to engineer maintenance of way of the system, with headquarters at Kansas City. He was holding the latter position at the time of his recent promotion to assistant chief engineer, with the same headquarters.

Coincident with the division of the Chicago, Rock Island & Pacific Lines into three operating districts on July 1, a district maintenance engineer was appointed for each district. **Lorne J. Hughes,** division engineer of the Nebraska-Colorado division, with headquarters at Fairbury, Neb., was appointed district maintenance engineer of the First dis-

Lorne J. Hughes

trict, with headquarters at Des Moines, Iowa. **W. E. Heimerdinger,** division engineer of the Cedar Rapids-Dakota division, with headquarters at Cedar Rapids, Iowa, has been appointed district maintenance engineer of the Second district, with headquarters at Kansas City, Mo. **Harold T. Livingston,** acting assistant superintendent of the Arkansas-Louisiana divisions, at Little Rock, Ark., has been appointed district maintenance en-

(Continued on page 498)

Veronalloy Track Tools are made of the finest of special alloy steels by workmen whose entire lifetime has been devoted to the production of one type of tool—the best.

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SINCE 1873

WOODINGS–VERONA
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SINCE 1873

gineer of the Third district, with headquarters at El Reno, Okla. **E. F. Manson,** division engineer of the Missouri division (now abolished), with headquarters at Trenton, Mo., has been transferred to the Nebraska-Colorado division, at Fairbury, to succeed Mr. Hughes and **R. R. Bragg** has been appointed division engineer of the Cedar Rapids-Dakota division, at Cedar Rapids, to replace Mr. Heimerdinger.

Mr. Hughes was born on August 24, 1884, at Billerica, P. Q., and was graduated from Rennselaer Polytechnic Institute in 1905. After serving in the engineering department of the American Bridge Company, Mr. Hughes entered railroad service on October 1, 1906, as a draftsman in the bridge department of the Rock Island, being advanced to assistant engineer at Davenport, Iowa, in 1910. In 1911 he was promoted to division engineer at Dalhart, Tex., being subsequently transferred successively to Eldon, Mo., and Herington, Kan. In 1917 he was promoted to special engineer reporting to the chief engineer, and during the World War he saw active service in France as a captain in the 108th Engineers. On the close of the war, he was appointed inspector of maintenance of way of the corporate organization of the Rock Island, and later was promoted to division engineer of the Chicago Terminal division. In 1923 he was further advanced to special engineer, reporting to the chief engineer, and on February 1, 1929, he was promoted to engineer maintenance of way. In 1930 Mr. Hughes was appointed engineer maintenance of way of the First district, with headquarters at Des Moines, Iowa, and on July 1, 1932, when the position of engineer maintenance of way of the First district was abolished he was appointed division engineer of the Nebraska-Colorado division, with headquarters at Fairbury, which position he was holding at the time of his recent appointment as district maintenance engineer of the First district.

Mr. Livingston was born on November 10, 1888, at Golden City, Mo., and graduated from the University of Missouri, Columbia, Mo., with the degree of bachelor of science in civil engineering. Following his graduation, Mr. Livingston taught mathematics at the Santa Monica Military Academy in California, and served as an assistant in the engineering department of the Southern Pacific at Mojave, Cal. He entered the service of the Rock Island on May 15, 1909, as an instrumentman at Topeka, Kan. In 1915, after occupying various minor positions, he was promoted to assistant engineer on the Iowa division, at Cedar Rapids, Iowa, then being transferred to Manly, Iowa, and later back to Cedar Rapids. Mr. Livingston was appointed master carpenter at Cedar Rapids in 1916, where he remained until 1917, when he enlisted in the United States Army. During the World War he served in France as captain of Company E, 313th Engineers, 88th division. In 1919 he returned to railway service as division engineer of the Minnesota division of the Rock Island at Manly. Subsequently he was transferred successively to Des Moines, Iowa, and to Little Rock, Ark., and on January 16, 1930, he was appointed engineer of construction at Chicago. On May 16, 1936, he was appointed acting assistant superintendent at Little Rock, which position he was holding at the time of his recent appointment as district maintenance engineer of the Third district.

Harold T. Livingston

Track

P. M. Loftus, an extra gang foreman on the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to roadmaster at Janesville, Wis., to succeed **Charles A. Drawheim,** whose death on June 25 was noted in the July issue.

W. A. Gunderson has been appointed temporary roadmaster on the Nebraska-Colorado division of the Chicago, Rock Island & Pacific, with headquarters at Fairbury, Neb., succeeding **C. Kelley,** who has been granted a leave of absence.

J. M. Fahey, assistant roadmaster on the Chicago & North Western at Adams, Wis., has been promoted to roadmaster with headquarters at Winona, Minn., to succeed **J. B. Buscovick** who has been granted a leave of absence because of ill health.

Thomas A. Handley, a section foreman on the Cleveland, Cincinnati, Chicago & St. Louis at Flat Rock, Ill., whose promotion to supervisor of track at Harrisburg, Ill., was announced in the July issue, was born on October 6, 1885, near Albion, Ill. Mr. Handley entered railway service as a laborer on the Cleveland, Cincinnati, Chicago & St. Louis in January, 1909, serving in this capacity at Grayville, Ill., until 1912. In that year he was advanced to track foreman and served in that capacity continuously on the Cairo division until his recent promotion to track supervisor.

William Johnston, assistant roadmaster on the Chicago, Burlington & Quincy at Galesburg, Ill., has been promoted to roadmaster, with headquarters at Centralia, Ill., to replace **G. L. Griggs, Jr.,** who has been transferred to Hannibal, Mo., where he succeeds **J. R. Kanan.** Mr. Kanan has been transferred to Galesburg to succeed **G. E. Yahn,** whose appointment as district engineer maintenance of way of the Central district at Burlington, Iowa, is noted elsewhere in these columns. **L. W. Benson,** track foreman in the Galesburg yards has been appointed assistant roadmaster with the same headquarters.

A. P. Schmitt, track supervisor on the St. Louis Terminal division of the Missouri Pacific, has been promoted to roadmaster on the Omaha division, with headquarters at Weeping Water, Neb., to succeed **G. M. Helmig,** who has been transferred to the Central Kansas division, with headquarters at Marquette, Kan., to replace **C. Augustine.** Mr. Augustine has been appointed track supervisor at Ordway, Colo., to succeed **J. L. White,** who has been appointed roadmaster at Carthage, Mo., to replace **H. M. Noel,** who has been transferred to the St. Louis Terminal division to succeed **C. J. Jaeschke,** whose appointment as division engineer is noted elsewhere in these columns. **F. R. Woolford,** track supervisor on the Missouri-Illinois Railroad west of the Mississippi river, has been transferred to the St. Louis Terminal division to succeed Mr. Schmitt.

Ronald H. Jordan, who has been appointed track supervisor on the Erie, with headquarters at Marion, Ohio, as announced in the July issue of *Railway Engineering and Maintenance*, was born on April 8, 1907, at Toledo, Ohio. After studying a year at Toledo university, Mr. Jordan entered Purdue university, from which he graduated with a degree in civil engineering in 1929. In June of the same year he entered the service of the Erie as a rodman on the engineering corps at Huntington, Ind. Early in the following year he was made a levelman at Marion, Ohio, and in May, 1930, he was further advanced to transitman with the same headquarters. In April, 1931, after serving for several months as a trackman at Marion, Mr. Jordan was returned to the position of transitman at the same point and for several years thereafter he alternated between the positions of transitman and trackman at Marion. In March, 1933, Mr. Jordan was appointed assistant track foreman at Akron, Ohio, and in February, 1934, he was made track foreman, with headquarters at Polk, Ohio. In July, 1934, he was advanced to general foreman at Cleveland, Ohio, which position he was holding at the time of his recent appointment as track supervisor at Marion.

A. J. Wright, whose appointment as roadmaster on the McCook division of the Chicago, Burlington & Quincy, with headquarters at Curtis, Neb., was reported in the June issue, has been connected with the Burlington for 20 years. He was born on November 1, 1897, at Ashland, Neb., and first entered railway service on May 8, 1916, as a section laborer on the Chicago & North Western at Wahoo, Neb. In July, 1916, he left this road to go with the Chicago, Rock Island & Pacific as a trackman, being advanced to section foreman in September, 1918. In May, 1921, Mr. Wright entered the service of the Burlington as a section fore-

(Continued on page 500)

man on the Lincoln division, being advanced to supervisor on the same division in September, 1931. In July, 1934, he was appointed assistant roadmaster on the McCook division, which position he held until his recent appointment as roadmaster on the Sterling division, which was effective on May 1.

Bridge and Building

J. W. Reed, assistant supervisor of bridges and buildings on the Philadelphia Terminal division of the Pennsylvania, has been appointed master carpenter on the Buffalo division.

Paul E. Strate has been appointed master carpenter of the Nebraska-Colorado division of the Chicago, Rock Island & Pacific, with headquarters at Fairbury, Neb. **F. J. Wirges** has been appointed master carpenter of the El Paso-Amarillo division, with headquarters at Dalhart, Tex.

Seymour B. Jones, who has been appointed division foreman of buildings on the Michigan Central, with headquarters at Jackson, Mich., as reported in the June issue of *Railway Engineering and Maintenance,* has been in the service of this company for 48 years. He was born on December 6, 1868, at Sherwood, Mich., and entered railway service with the Michigan Central in April, 1888, as a carpenter. From 1890 to 1891, Mr. Jones attended Angola Tri-State College at Angola, Ind. After leaving school he returned to the Michigan Central and has served with this road continuously until the present. He has held the positions of road foreman of buildings and carpenter foreman and was serving in the latter capacity at the time of his recent appointment as division foreman of buildings.

Obituary

L. C. Smith, supervisor of bridges and buildings of the Indiana Harbor Belt, and the Chicago River & Indiana, with headquarters at Hammond, Ind., died on July 9, following an extended illness.

Edward D. Sabine, formerly terminal engineer of the Grand Central Terminal of the New York Central at New York, died of a cerebral hemorrhage in that city on July 16 following a long illness.

T. Thompson, roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Joliet, Ill., died in that city on July 5 after an illness of several weeks. Mr. Thompson was the senior active member of the Roadmasters and Maintenance of Way Association and served that organization as president in 1911. He had been in the service of the Santa Fe for nearly 52 years. He was born on January 2, 1863, at Etne, Norway, and came to the United States at an early age, entering the service of the Santa Fe in 1884. After serving for a time as a section and extra gang foreman he was advanced to roadmaster. He held the latter position continuously until his death except for a period during the World War when he held the position of general track supervisor, at Topeka, Kan.

Supply Trade News

Personal

Alex Chapman, district sales agent of the **Rail Joint Company,** at Chicago, has been appointed western sales manager with the same headquarters. **R. R. Seward,** district sales agent, at New York, has been appointed eastern sales manager with the same headquarters.

J. C. Bloomfield, formerly with the Industrial Brownhoist Corporation, and the Harnishfeger Corporation, has been appointed sales representative of the **Link Belt Company,** Chicago, and will be in charge of the sale of shovels, draglines, and cranes to railroads.

J. L. Praytor has been appointed district manager of the **American Hoist & Derrick Company,** St. Paul, Minn., to cover the south and southeaster section of the country, including Alabama, North and South Carolina, Georgia, Florida, Tennessee, Kentucky, and Mississippi, with headquarters at 4601 First avenue, No., Birmingham, Ala.

Benjamin F. Affleck, president of the **Universal Atlas Cement Company,** a subsidiary of the United States Steel Corporation, with headquarters at Chicago, will retire on September 1 under the pension rules of the steel corporation to devote his time to private interests. **Blaine S. Smith,** president of the **Pennsylvania-Dixie Cement Corporation,** also a subsidiary of the United State Steel Corporation, with headquarters at New York, has resigned to become president of the Universal Atlas Cement Company to succeed Mr. Affleck. **John A. Miller,** chairman of the board of the Pennsylvania-Dixie Cement Corporation, has been elected president to replace Mr. Smith, and has been succeeded by **Victor N. Roadstrum,** a director. **George Kilian,** who has been acting as secretary and treasurer, has been appointed also assistant to the president. **Walter S. Wing,** general sales manager, and **W. H. Klein,** general operating manager, have been elected also vice-presidents and members of the board.

Benjamin F. Affleck

Mr. Affleck was born on March 1, 1869, at Belleville, Ill., and started his career at the age of 14, working for several years as a machinist, a stenographer and a clerk with various concerns. In 1896 he began as stenographer for the Illinois Steel Company (now the Carnegie-Illinois Steel Corporation), and in 1901 he became branch manager of that company's cement department at St. Louis. In 1906, when this department became a subsidiary of the United States Steel Corporation, Mr. Affleck became general sales manager. In 1915 he was elected president. He was one of the early members of the Portland Cement Association and was largely instrumental in reorganizing it in 1916, following which he served as its president for five years. Mr. Affleck has also been active in the civic life of Chicago, having served as president of the Union League Club, the Chicago Engineers Club and other groups.

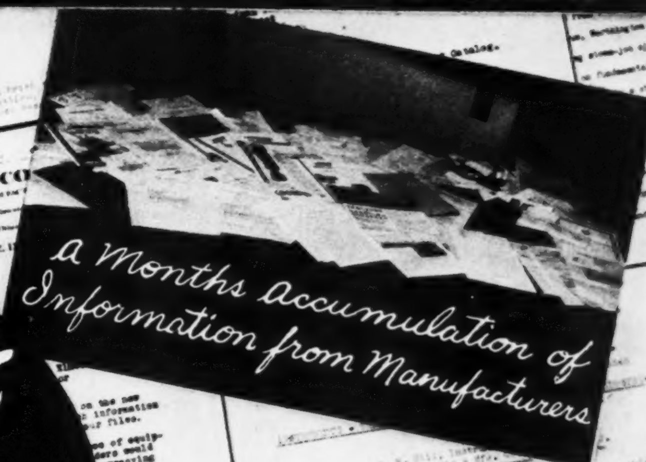
Blaine S. Smith

Mr. Smith was formerly connected with the Universal Atlas Cement Company. Following ten years' service in the traffic department of the Chicago & North Western, he entered the employ of the Universal Atlas Cement Company in 1908 as a salesman and advanced through various position to that of general sales manager in 1915, succeeding Mr. Affleck. In 1926 Mr. Smith was elected vice-president, from which position he resigned in 1928 to become president of the Pennsylvania-Dixie Cement Corporation. Mr. Smith has been active for many years in the Portland Cement Association, serving as president in 1925 and 1926. He was also president of the Cement Institute in 1929 and 1930, and is now a member of the board of both organizations.

Trade Publication

Internal Boiler Feedwater Treatment.—An eight-page illustrated folder, issued by the Permutit Company, New York, describes the equipment, chemicals, controls and laboratory service offered to the railways by this company for the proper internal treatment of locomotive boiler waters, to prevent the formation of scale, reduce foaming and priming, and to minimize pitting and corrosion.

TO RAILWAY SUPPLY MANUFACTURERS



a Market and a Medium

DOES RAILWAY ENGINEERING AND MAINTENANCE REACH RAILWAY OFFICERS? IS IT READ BY THEM?

These questions are answered for us by the many manufacturers who are constantly soliciting the co-operation of our editors in bringing new developments of theirs to the attention of our readers. These requests reflect the manufacturers' knowledge of the magnitude of the market served by this paper. They also demonstrate an appreciation of the value of Railway Engineering and Maintenance as the medium through which to reach this market.

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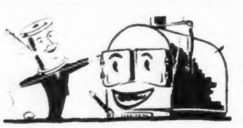

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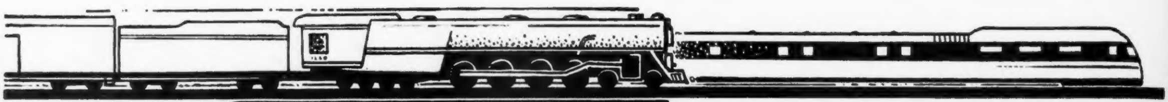

This Armco Metal Cribwall replaced a failing wingwall on an important railroad line. The upper view shows construction.

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